ISSN 2313-2205
2015/01

COMMONWEALTH TRADE POLICY DISCUSSION PAPERS

Aid for Trade and Structural Transformation in Sub-Saharan Africa

Xavier Cirera
L Alan Winters

The Commonwealth

Commonwealth Trade Policy Discussion Papers 2015/01
ISSN 2313–2205

By Xavier Cirera, economist in the Innovation, Technology and Entrepreneurship Global Practice of the World Bank Group, and L Alan Winters, professor of economics at the University of Sussex, UK.

Please cite this paper as: Cirera, X and LA Winters (2015), 'Aid for Trade and Structural Transformation in Sub-Saharan Africa', *Commonwealth Trade Policy Discussion Papers* 2015/01, Commonwealth Secretariat, London.

Abstract

This paper analyses empirically whether Aid for Trade (AfT) programmes have assisted the process of structural transformation in African countries. It first analyses the impact on trade flows and trade costs, which are the main channels of transmission from AfT flows to structural change, and then examines the direct impact on structural change. Using a rich dataset on trade and aid flows for sub-Saharan African (SSA) countries from 1995–2010, the paper shows that AfT flows appear not to have had any statistically significant impact, and the only positive impact that can be identified is in reducing the time of exporting and importing. Overall, the results suggest that factors other than AfT flows explain different experiences in relation to structural change in SSA.

JEL Classification Numbers: F02, F13, F15
Keywords: Aid for Trade, AfT, structural transformation, trade flows, sub-Saharan Africa

Contents

Abbreviations and acronyms 4

1. Background 5
2. Literature review 6
   - 2.1 Structural change in SSA 6
   - 2.2 Impacts of AfT 8
   - 2.3 Trade and structural change 10
3. AfT and structural change: a conceptual framework 11
4. Data 12
5. Evolution of AfT and structural change in SSA (1995–2010) 13
   - 5.1 AfT flows into SSA 13
   - 5.2 Structural change in SSA 19
6. The impact of AfT on structural change 27
   - 6.1 The impact of AfT on trade flows and trade costs 27
     - 6.1.1 Trade costs 27
     - 6.1.2 Trade flows 30
   - 6.2 AfT and structural change 39
7. Conclusions and policy implications 41

Appendix 43

References 51

Abbreviations and acronyms

AfT	Aid for Trade
AfDB	African Development Bank
CPIA	Country Policy and Institutional Assessment
DAC	Development Assistance Committee
GDP	Gross Domestic Product
GMM	Generalised Method of Moments
IDA	International Development Association
OECD	Organisation for Economic Co-operation and Development
RCA	Revealed Comparative Advantage
SSA	Sub-Saharan Africa
TFP	Total Factor Productivity
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
USAID	United States Agency for International Development
WDI	World Development Indicators
WTO	World Trade Organization

1. Background

African economies have experienced unprecedented growth rates during the last 15 years, only briefly interrupted by the financial crisis in 2008 and the trade collapse in 2009. A large expansion of exports, which increased five-fold during the period 1995-2008, mainly driven by increased demand from emerging markets, especially China, and the resultant increase in commodity prices, has been a critical determinant of this large growth spell.

A traditional characteristic of African exports, however, has been the large degree of concentration in primary commodities and natural resources. This lack of diversification of the export base is associated with two important risks for these economies. First, export concentration increases their vulnerability to price commodity shocks. Second, concentration in primary product exports locks the production base of these economies in products of low levels of sophistication and value added, and often with low levels of employment as well; all of which limit the extent to which these economies can grow, increase productivity and achieve structural change.

Structural change is at the core of traditional development economics models, after Lewis (1954). Accordingly, the process of economic development can be characterised by the reallocation of factors of production and employment from lowproductivity 'traditional' sectors, such as agriculture, to high-productivity 'modern' sectors, such as manufacturing. This positive structural change leads to higher economic growth and increase in living standards by shifting people's occupation to activities of higher labour productivity. However, when patterns of production specialise in primary products, factors of production can reallocate from higher to lower productivity sectors. Indeed, there is strong evidence suggesting that despite this significant expansion of exports and the increasing integration in the world economy, African economies are not achieving structural change towards modern sectors. On the contrary, McMillan and Rodrik (2011) suggest that these economies are shifting resources and employment over time to lower productivity sectors.

In parallel to this significant export growth, African economies have experienced an increasing inflow of development assistance related to trade, Aid for Trade (AfT). These are programmes targeting trade-related constraints in developing countries such as infrastructure, policy frameworks or supply-side constraints. AfT programmes from Organisation for Economic Co-operation and Development (OECD) countries tripled from US$10 billion in 2002 to US$33 billion in 2010. Given the nature and size of these flows, and the challenge of structural transformation for African economies, one important question that needs to be investigated is what role AfT programmes are playing in structural change.

This paper analyses this question empirically, employing a rich trade and aid flows dataset for sub-Saharan African (SSA) countries during the period 1995–2010. Since AfT programmes do not have structural change as a direct explicit objective, our methodological approach consists of two stages. AfT programmes can only have an impact on structural change if they change production structures and reallocate employment across sectors. Given the nature of interventions in this area, this can only occur if AfT programmes are first effective at changing trade costs and trade flows. Therefore, in the first stage, we analyse the impact that these programmes have had on these direct objectives, mainly trade costs and trade flows.

However, reducing trade costs and increasing exports does not necessarily imply structural changes in sector productivity and labour shares. As a result, in the second stage we look more directly to the impact of AfT flows on measures of structural change.

The paper is structured as follows. The next section provides a short review of the existing evidence in relation to three key elements of our research question: impacts of AfT programmes, the evolution of structural change in SSA and the link between trade and structural change. Section 3 spells out the causal framework though which AfT is expected to impact structural change. Section 4 describes the data and methodology used. In section 5 we describe the nature and evolution of AfT allocation and structural change in SSA. Section 6 shows results from the evaluation of impacts of AfT on structural change. We present our conclusions in the final section.

The main findings suggest that other factors rather than AfT flows explain the different experiences in relation to structural change in SSA.

2. Literature review

To our knowledge, no study has addressed directly the impact of AfT on structural change. As we will show in the following section, AfT includes interventions designed to reduce trade costs and improve trade policy frameworks. These are expected to have positive impacts on trade, in both exports and imports. As a result, the main channel through which AfT can affect structural change is by affecting trade. These changes in trade are likely to impact productivity and production structures; however, as we will discuss in the following section, it is unclear in which direction these changes will occur. What is certain is that if AfT does not affect trade flows, it will have no impact on structural change. In this section, therefore, we review the evidence in relation to two fundamental channels for the causality between AfT and structural change: the evidence on the impact of AfT on trade flows, and the evidence on the impact of trade on structural change.

However, before reviewing the literature, it is important to review the evidence on structural change in SSA.

2.1 Structural change in SSA

A few studies have analysed structural change in SSA, most of which report a strong specialisation in agriculture and extractive industry sectors. Memedovic and Lapadre (2010) identify three different periods regarding structural change.

During the first, in the 1970s, strong increases in extractive industry value-added were seen. This was followed, during the period 1980–1995, by a large expansion of the services sector, which was reverted in the later period, after 1995, by a deepening of its specialisation in raw material production to the detriment of manufacturing and services.

These findings are supported by Szirmai (2012), who suggests that Africa and some Latin American countries have become exceptions in terms of structural change. According to this author, between 1980 and 2005 the share of manufacturing in total output continued to increase in many Asian economies, while there was a process of deindustrialisation in Latin America and Africa. Concretely, in the 22 African countries for which we have data, manufacturing output ranged between 8.5 per cent and 13.3 per cent of gross domestic product (GDP), with an 11 per cent average for the continent.

This process of 'negative' structural change, or reallocation away from high productivity sectors in certain regions, is well documented by McMillan and Rodrik (2011). The authors calculate labour productivity for a set of countries and decompose aggregate productivity growth in two components: within-sector total-factor productivity (TFP) growth and growth due to the reallocation of labour share between sectors. TFP growth within sectors is the result of increases in productivity and rationalisation of productive units as countries face, for example, more competition from opening up markets and integrating into the world economy. However, growth due to the reallocation of labour share between sectors corresponds to structural change, since it measures the aggregate productivity gain or loss associated with employment reallocation to more or less productive sectors. McMillan and Rodrik (2011) find a negative contribution of such structural change on productivity for Latin America and Africa, indicating that lower productivity sectors are increasing their share of labour. The authors suggest that the factors that increased deindustrialising structural change were high commodity prices and the pattern of comparative advantage in the region.

Page (2011) also emphasises the idea of negative structural change and indicates that value-added and the labour share in manufacturing is lower in SSA than in middle-income countries, and also that productivity levels within manufacturing are low in comparison with other countries. According to Page (2011), this implies that there is very little productivity growth in SSA. He suggests that emphasis on investment climate reforms are likely to accentuate negative structural change, and the focus of interventions should be less on regulation and more on infrastructure and skills gaps. This has implications for the type of interventions funded by AfT in relation to structural change, since these regulatory reforms appear to favour existing comparative advantage sectors and increase trade shares away from manufacturing.

One important caveat accompanying this literature is the aggregation of productivity across sectors. It is well documented that there are large firm-level productivity differences within sectors (Hsieh and Klenow 2009). Since the firm is the unit of activity, an ideal measure of structural change should be constructed looking at TFP growth and reallocation across firms in the economy. This is difficult to estimate given the limitations in sector coverage of firm-level surveys. However, measures of

Box 1. Measures of structural change

Structural change implies a reallocation of resources across productive sectors and changes in the pattern of production. Several measures has been suggested in the literature to measure structural change:

- Sector output, value-added or employment shares. This is the most simple of the measures and focus on changes in these shares. For example, Groshen and Potter (2003) analyse the distribution of workers throughout the economy. They measure permanent and cyclical sector labour changes after specific shocks. If reallocation across sectors is permanent, they label the change as structural change.
  Other authors use changes in the sector shares of an assumed advanced or higher productivity sector directly. This requires some assumptions about what comprise these modern sectors and the existing heterogeneity within sectors.
- Constant market shares. Memedovic and Lapadre (2010) suggest measuring changes in the contribution of different sectors compared to those of a reference country.
- Productive capabilities indicators. (Andreoni 2012). Index based on measuring four different factors, namely capability determinants, capability enablers, capability outcomes and production outputs.
- Sector reallocations (McMillan and Rodrik 2011). A measure of structural change based on the decomposition of aggregate productivity growth. Labour productivity growth in an economy can be achieved in one of two ways. First, productivity can grow within economic sectors through capital accumulation, technological change or reduction of misallocation across plants. Second, labour can move across sectors, from low-productivity sectors to high-productivity sectors, increasing overall labour productivity in the economy. The authors use this second measure as a proxy for structural change.
- Labour productivity convergence. Rodrik (2011) estimates a model of convergence in labour productivity in manufacturing activities across countries. The coefficients give information about structural change when there is convergence between low-productivity and high-productivity countries.

structural change based on aggregate sectors may mask large firm-level productivity heterogeneity.

In addition, there is also considerable heterogeneity regarding the type of production structure changes in SSA. Bhorat (2000) for example, suggests that in South Africa, the economy has shifted from dependency on natural resources to higher productivity services. While this result is not necessarily common in the region, given the nature of the South African economy, it suggests the need to consider different country experiences when looking at structural change.

2.2 Impacts of AfT

AfT programmes aim to provide development assistance in order to help countries to negotiate and implement trade agreements; build the physical, human, and institutional capacity to benefit from trade and investment opportunities; and assist specific sectors that have significant export potential. The significant increase in AfT programmes in the last decade and the push for this type of development assistance programmes by institutions such as the World Trade Organization and the OECD increase the need to understand its effectiveness, especially given the fact that there have been doubts about the effectiveness of these programmes.[1]

Recently a significant number of evaluations of AfT programmes and the impact of aid on trade have emerged, most of which tend to find a positive impact of these programmes or assistance in general on trade flows. For example, the United States Agency for International Development (USAID 2010: 59) suggests that as the number of export sectors from developing regions that received AfT assistance rose sharply between 2002 and 2009, there was a 99 per cent increase in the number of products exported from Africa, from 87.13 to 186.4. However, such correlation does not indicate causality, since programmes can be targeting countries that are already exporting more.

Other studies have used more robust statistical methods to measure attribution. Helble et al. (2009: 2) used a gravity model and found 'strong empirical evidence that aid directed to the trade facilitation reform agenda has a small, but significant and positive impact on trade flows'. This is corroborated by Nowak-Lehmann et al. (2010), who, also using a gravity model for a broader number of countries and donors, found a positive, although small, impact of AfT on exports of recipient countries.

This positive impact of aid on exports is found, in some cases, to go on the direction of the donor. For example, Wagner (2003) shows econometrically that for every dollar in Japanese aid, 35 cents goes back to Japan for exports of goods related to the aid-financed project and another 98 cents go to Japan in exports of goods not directly linked to aid projects. A similar effect is observed in a gravity model with European Union (EU) aid to the Middle East and north African countries. Martinez-Zarzoso et al. (2012: 20), estimate a small and positive effect of aid on trade, but also interpret the results as 'indirect evidence of informal tying of aid to trade and the donors' benefit from giving aid'.

Looking more specifically at AfT programmes, some authors have analysed the effectiveness of different types of AfT on trade. For example, Cali and te Velde (2011: 725) suggest that a significant impact of AfT on exports 'is entirely driven by aid to economic infrastructure, while the other main category of aid for trade, aid to productive capacity, has no discernible effect on exports'. Brenton and von Uexkull (2009) find that export development programmes have coincided with or predated stronger export performance. Therefore, AfT programmes appear to be more effective where there is already significant export activity, which raises concerns about the 'additionality' of the programmes.

However, not all evidence is positive. Other studies show how aid reduces competitiveness due to exchange rate overvaluation (Rajan and Subramanian 2005). Lloyd et al. (2010: 7) suggest that 'a statistical link between aid and trade, of whatever form, is the exception rather than the norm'. In addition, some authors have found that AfT can have a negative impact on nonrecipient countries. Silva and Nelson (2012) find a positive direct effect on the trade of aid recipients of around 13 per cent compared to the level of imports of countries without aid flows. However,

1 OECD (2011: 42) suggests that traditional evaluations of AfT programmes did not say much about the impact on trade, and were based mainly on opinions, rather than real indicators.

the authors also find a negative effect of aid on donor trade for nonrecipients for most periods, with the exception of 1996–2000. This negative effect appears large enough to produce a negative, although very small, average impact on trade across all countries, including nonrecipients.

In summary, most of the studies reviewed suggest a positive but small impact of aid on trade flows, often biased towards donors' bilateral trade. Furthermore, the evidence suggests that some flows may be directed to those who are already high-export performers, may have negative effects on excluded countries and may generate negative impacts though exchange rate overvaluation.

2.3 Trade and structural change

Trade is expected to impact structural change through two main channels: impact on productivity and changes in the sector composition of production or employment. It is not clear, however, in what direction trade may impact structural change. A large number of papers have documented that increases in the level of openness or integration in the world economy increase productivity (Abizadeh and Pandey 2009; Jiang 2012; Maroto-Sánchez and Cuadrado-Roura 2009). However, these productivity increases occur across all sectors that increase their trade exposure and, therefore, do not specify in what direction structural change is likely to occur.

Changes in trade policy, at home or in export markets, and the resultant increases in trade affect the reallocation of factors of production across sectors. Integration in international markets changes relative prices and relative demand, and this is likely to facilitate the shift of resources to export sectors or comparative advantage sectors, as McMillan and Rodrik (2011) show. In addition, increases in imports and domestic competition reallocate production factors from nonefficient to efficient sectors.

Therefore, when analysing the impact of trade on structural change it is important to understand what are the sectors of comparative advantage and who are those experiencing more domestic competition. This is likely to provide insights into what sectors experience larger TFP increases and what happens to the labour allocation across sectors. In the case of TFP growth, trade will affect those sectors that are more trade exposed. For example, Havlik (2005) measured aggregate productivity growth for the new Central and Eastern European members of the EU, and found that productivity increases occurred in specific sectors rather than in all the economy. In addition, export sectors may benefit from larger productivity increases via the role of technological opportunities (Montobbio and Rampa 2005).

Conversely, trade will impact labour reallocation depending on the nature of domestic policy distortions. Changes in policy distortions and incentives will bias output growth towards specific sectors and favour specific labour reallocations. Teignier (2012) developed a two-sector model to explain structural change. In the model, in closed economies as countries develop and agriculture productivity increases, labour is reallocated from agriculture to the industrial sector. Trade accelerates this transition for those countries that are agricultural importers. The author calibrates the model for the experience of the USA, UK and Korea and finds that without trade the UK would have had similar labour agricultural shares to the USA in the nineteenth century, while distortions in agriculture in Korea slowed down considerably the transition of labour away from agriculture.

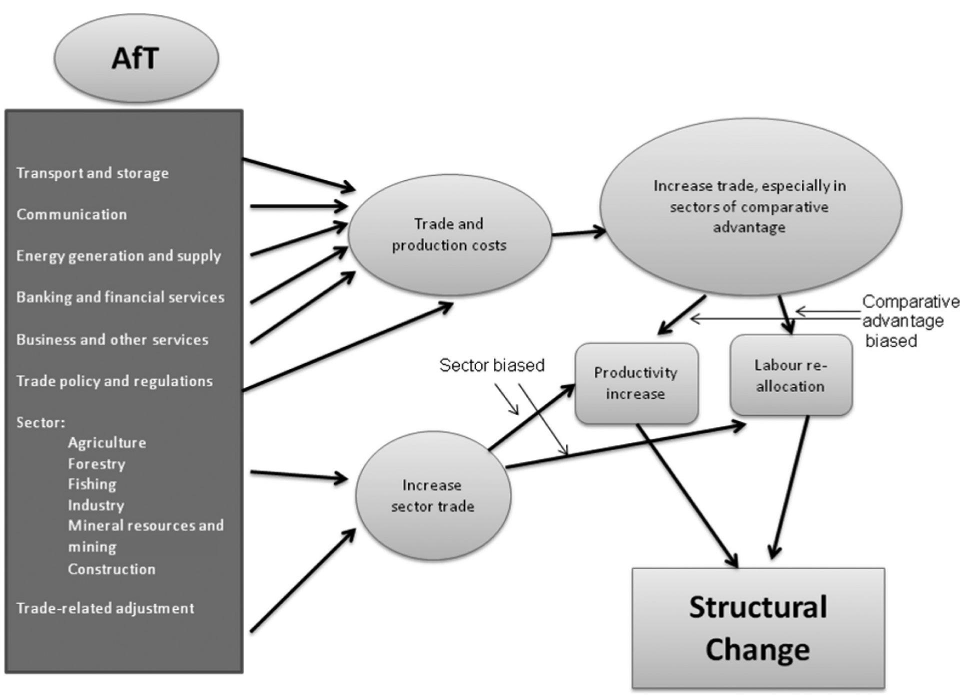
Page (2011) also emphasises the role of policy in facilitating structural change and suggests that investment climate reforms in Africa have larger effects in encouraging production in sectors of comparative advantage, therefore favouring the reallocation of labour to low-productivity sectors.

Trade and trade policy are therefore, identified in the literature as enablers/ inhibitors of structural transformation.

3. AfT and structural change: a conceptual framework

Figure 1 shows graphically a conceptual framework in order to understand the impact of AfT programmes on structural change. As suggested above we separate the causal change between AfT and structural change in two stages: the impacts of AfT on trade costs and trade, and the impact of trade changes on structural change.

Figure 1. Conceptual framework demonstrating the impact of Aid for Trade programmes on structural change



The left-hand box in Figure 3 shows the main sectors of intervention for AfT programmes. We can differentiate two main sets of interventions. The first set aims at reducing trade costs via directly affecting costs of trade, production or services. This would include interventions in transport and storage, communication, energy generation and supply, banking and financial services, business and other services and trade policy and regulations. These interventions are 'sector'-neutral in the sense that are not directed towards specific sectors but the economy as a whole; however, they are likely to favour sectors of comparative advantage in the absence of large sector distortions.

The second group of interventions target specific sectors such as agriculture, forestry, fishing, industry, mineral resources and construction. These sector interventions, if effective, are likely to increase production and productivity, and bias structural change towards those sectors.

Finally, trade-related adjustment interventions could, in principle, also support structural change by facilitating the transition from inefficient sectors to more production during adjustment to trade reform. However, this type of intervention accounts for only a small subset of trade policy and regulations interventions (around 13 per cent of trade policy and regulations interventions), and, more importantly, they focus mainly on compensating government revenue after trade reform, rather than workers. Therefore, it is unlikely that these interventions play a very significant role in structural change.[2]

In the first stage, the first set of AfT interventions is likely to reduce trade costs, which is expected to boost exports, especially in the comparative advantage sectors, and imports. Sector AfT interventions are expected to boost sector exports directly. In the second stage, these changes in trade are expected to increase sector TFP and reallocate resources across sectors. These stages are examined empirically in sections 5 and 6.

Consideration should be given to the fact that structural transformation refers to structural, as opposed to cyclical, changes. Such changes are often difficult to measure given the short-run nature of AfT interventions.

4. Data

We build here a dataset with four main components. The first is the trade dataset based on BACI product level flows for the period 1995–2010. The main advantage of this dataset, based on United Nations Comtrade data, is that it corrects for some nonreporting flows using mirror data. This is important, since reporting

2 One channel through which these interventions may facilitate structural change is by reducing government opposition to trade reform due to budget compensation.

problems are more prevalent in SSA countries than elsewhere. Moreover, this dataset is based on the same 1992 harmonised system nomenclature for the whole period. One disadvantage, however, is that it treats the Southern African Customs Union as a single territory and, therefore, we do not have disaggregated data for South Africa, Botswana, Namibia, Swaziland and Lesotho.

The second component is the Aid flows dataset. This is based on the OECD Development Assistance Committee (DAC) dataset, which disaggregates all registered disbursed aid flows at the DAC-5 sector level. This allows us to use sector and AfT flows. Although some emerging economies, such as the Gulf States, have been included in recent years, the dataset is mainly restricted to OECD countries. However, emerging economies have increased their development co-operation engagement significantly in SSA countries in recent years. In order to include these countries we use data available at aiddata.org which quantify all the sector level aid flows from South Africa, Brazil, India and the Gulf States that can be considered aid flows under DAC criteria. Unfortunately, data for Chinese aid projects tend not to have any information on values and, therefore, could not be included.

The third component of the dataset is related to the measurement of structural change. For this we use mainly the World Bank's World Development Indicators (WDI) data for value added per worker, sector value-added, population, active population and sector labour shares. We also tried to use United Nations Industrial Development Organization data for the manufacturing sectors, but the lack of sufficient observations precluded estimating productivity decompositions for the entire economy.

The final component of the dataset is the trade costs component. This is based on two sources. First, we use the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)-World Bank bilateral trade costs database, which provides comprehensive estimates of bilateral trade costs for a large number of countries and three sectors: agriculture, industry and both. Second, we use some of the existing 'doing business' indicators available from the WDI, related to trade costs, trade policy and logistics.

5. Evolution of AfT and structural change in SSA (1995–2010)

Before analysing the impact of AfT programmes on structural change in SSA, it is important to understand the nature of AfT flows in the region, as well as the extent of structural change.

5.1 AfT flows into SSA

AfT flows to SSA have been steadily increasing during the period 1995-2010. According to the data available in the

Table 1a. Main recipient countries of Aid for Trade, 1995–2010 (US$ million)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Ethiopia	19.18	65.39	63.34	48.37	47.81	117.63	271.87	379.01	245.38
Tanzania	37.49	82.19	80.32	108.86	128.42	136.66	169.99	145.62	314.84
Ghana	90.41	86.83	61.37	142.30	83.58	163.85	171.85	129.82	199.87
Mozambique	46.62	74.17	61.86	87.72	79.42	104.92	132.49	212.08	251.32
Uganda	11.71	30.58	35.80	31.49	45.75	84.30	143.68	79.57	95.15
Kenya	145.51	87.85	48.81	68.81	85.54	201.77	158.54	71.49	109.90
Madagascar	8.00	44.13	51.94	47.19	33.50	87.66	101.94	140.19	146.03
Mali	22.12	50.67	56.85	38.56	59.65	65.59	58.59	97.96	121.67
Dem. Rep. Congo	4.34	5.19	0.74	10.52	4.13	1.99	10.94	316.96	120.11
Senegal	24.22	41.63	36.94	30.98	57.61	69.42	149.34	93.10	121.63
Burkina Faso	15.34	36.79	48.39	44.00	37.85	48.98	73.90	75.13	111.15
Zambia	10.91	32.24	64.30	39.39	8.26	169.05	164.74	168.78	113.27
Nigeria	7.78	4.93	2.06	1.67	0.49	12.38	16.61	20.28	37.63
Cameroon	34.05	48.38	92.06	38.01	33.65	115.99	97.19	93.77	78.35
Benin	26.28	33.92	38.61	35.68	16.65	43.99	56.13	54.15	86.48
Total sub-Saharan Africa	782.66	1,200.57	1,195.74	1,215.12	1,269.41	2,052.52	2,428.81	2,813.83	2,937.91

Source: Author's elaboration from OECD DAC database

OECD-DAC database, and including other emerging markets with data available,[3] AfT flows increased by a factor of almost 10 during the period, from US$782 million to US$7.5 billion.

Tables 1a&b and 2a&b show the main recipients and donors of AfT flows. The main recipient country during the period was Ethiopia, which absorbed 9.19 per cent of all flows to the region, followed by Tanzania, Ghana, Mozambique and Uganda. These are the countries that absorbed most of the AfT flows in the past 5 years, plus Nigeria, which experienced a significant increase in AfT flows in the past 5 years.

Looking at the main donor countries in Table 2a&b it can be seen that more than half of AfT flows in the region were disbursed by two multilateral funds, the International Development Association (IDA), managed by the World Bank, and the African Development bank (AfDB), plus the EU. The largest bilateral donor was Japan with around 8 per cent of flows, followed by France, Germany and USA. However, these countries also

3 Brazil, India, South Africa and Gulf states.

Table 1b. Main recipient countries of Aid for Trade, 1995–2010 (US$ million)

	2004	2005	2006	2007	2008	2009	2010	Total 1995-2010	Share 1995-2010
Ethiopia	334.56	332.76	447.70	478.06	560.22	1,011.88	553.04	4,976.22	9.19
Tanzania	390.94	303.60	341.38	366.02	478.70	549.92	732.42	4,367.36	8.06
Ghana	226.61	307.53	285.08	313.01	380.20	401.19	552.27	3,595.75	6.64
Mozambique	310.65	336.81	351.87	325.41	332.71	330.86	341.60	3,380.50	6.24
Uganda	204.91	182.91	222.12	490.80	439.62	445.89	422.87	2,967.14	5.48
Kenya	140.30	125.33	187.46	329.45	319.86	345.11	387.88	2,813.60	5.20
Madagascar	277.79	218.39	240.30	328.20	268.27	132.97	126.51	2,253.00	4.16
Mali	134.50	183.49	172.67	297.16	239.78	260.06	336.23	2,195.56	4.05
Dem. Rep. Congo	128.00	204.68	178.37	161.33	261.81	458.37	287.63	2,155.11	3.98
Senegal	163.48	150.91	179.34	182.22	291.88	210.93	244.55	2,048.17	3.78
Burkina Faso	114.64	128.57	169.88	242.06	175.30	219.36	231.08	1,772.42	3.27
Zambia	122.75	135.69	149.33	105.26	176.74	127.40	115.91	1,704.01	3.15
Nigeria	59.39	115.96	160.26	339.80	226.10	244.20	425.39	1,674.93	3.09
Cameroon	165.27	96.55	110.91	149.57	133.79	139.46	158.37	1,585.36	2.93
Benin	92.97	66.85	65.90	100.66	181.96	177.82	184.23	1,262.26	2.33
Total sub-Saharan Africa	3,713.70	3,763.34	4,080.63	5,579.20	6,529.07	7,067.42	7,523.73	54,153.67	

contributed to IDA funds, and, in the case of European countries, to EU AfT programmes. One interesting element in the data is that for emerging economies with data available, only Kuwait and the United Arab Emirates have AfT flows; Brazil, South Africa, India and Saudi Arabia had no disbursement on AfT, according to the dataset.

AfT flows have increased during the period for most African countries. Figure 2 shows the evolution of AfT flows and total aid. AfT flows have increased substantially in countries like Sudan, Nigeria, Liberia and Democratic Republic of Congo. Only in Equatorial Guinea has the gap between AfT and total aid broadened significantly in recent years, and AfT flows appear to have diminished during the period.

Deconstructing AfT by sector of disbursement reveals some interesting elements (Figure 3). Around 60 per cent of the value of AfT flows is concentrated in only two sectors: transport and storage (~35 per cent share on average) and the agriculture sector (~24 per cent share on average). These sectors are followed by energy (~13 per cent) and the banking and financial sector (~6 per cent on average). The remaining sectors have an average share less than 5 per cent, with the industrial sector absorbing 4.8 per

Table 2a. Main Aid for Trade donors, 1995–2010 (US$ million)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
International Development Association	0.00	0.00	0.00	0.00	0.00	1,044.30	1,011.71	1,333.91	1,111.66
EU institutions	0.00	243.19	297.17	296.64	328.96	190.94	210.87	320.56	453.05
Japan	182.99	354.67	253.17	326.57	378.46	300.15	256.25	169.98	258.84
African Development Fund	0.00	0.00	0.00	0.00	0.00	0.00	244.86	255.11	200.49
France	287.71	216.24	167.50	104.61	173.61	150.86	144.37	181.90	158.98
Germany	177.51	205.96	181.48	144.01	167.21	86.37	150.45	141.21	159.78
USA	0.00	1.24	0.00	0.00	0.00	0.00	0.00	50.69	109.57
UK	0.00	0.00	0.00	50.47	51.73	72.16	98.00	73.31	56.60
Denmark	0.00	0.48	63.53	83.00	0.00	41.06	37.42	0.00	60.84
Sweden	78.16	109.39	103.77	65.41	46.45	41.94	44.05	31.55	48.84
Canada	37.51	36.80	41.68	34.06	27.01	40.07	17.05	16.73	22.61
Norway	0.00	0.00	0.00	0.00	0.00	0.00	37.61	53.98	71.05
Belgium	0.00	0.00	0.00	0.00	26.77	25.63	36.74	41.14	45.63
Spain	5.65	0.00	51.59	36.26	29.83	26.91	20.78	8.15	55.49
The Netherlands	0.33	0.00	0.00	42.96	0.00	0.00	75.26	52.45	31.51
Total	782.66	1,200.57	1,195.74	1,215.12	1,269.41	2,052.52	2,428.81	2,813.83	2,937.91

Source: Author's elaboration from OECD DAC database

cent of the value of AfT flows. Sector-specific AfT amounts to around 37 per cent of flows in the period, and it is largely concentrated in agriculture, while more sector-'neutral' interventions aimed at reducing trade and production costs account for 63 per cent of flows.

Disaggregating these sectors even further to the five-digit DAC classification shows that one subsector, road transport, concentrates the largest share of AfT, absorbing 27.5 per cent of AfT flows. The remaining subsectors have much smaller shares. Electrical transmission/distribution accounted for 5.58 per cent of AfT flows, agricultural development 4.75 per cent, agricultural policy and administrative management 3.91 per cent, agricultural inputs 3.15 per cent, telecommunications 2.84 per cent and transport policy and administrative management 2.79 per cent. Most sectors, however, have less than 1 per cent share of AfT flows, which highlights the high concentration of AfT flows in road transport.

Figures A1 and A2 in the appendix show the sector decomposition of AfT flows by recipient and donor. There is heterogeneity in recipient countries, with some countries receiving AfT flows mainly in transport, others in agriculture

Table 2b. Main Aid for Trade donors, 1995–2010 (US$ million)

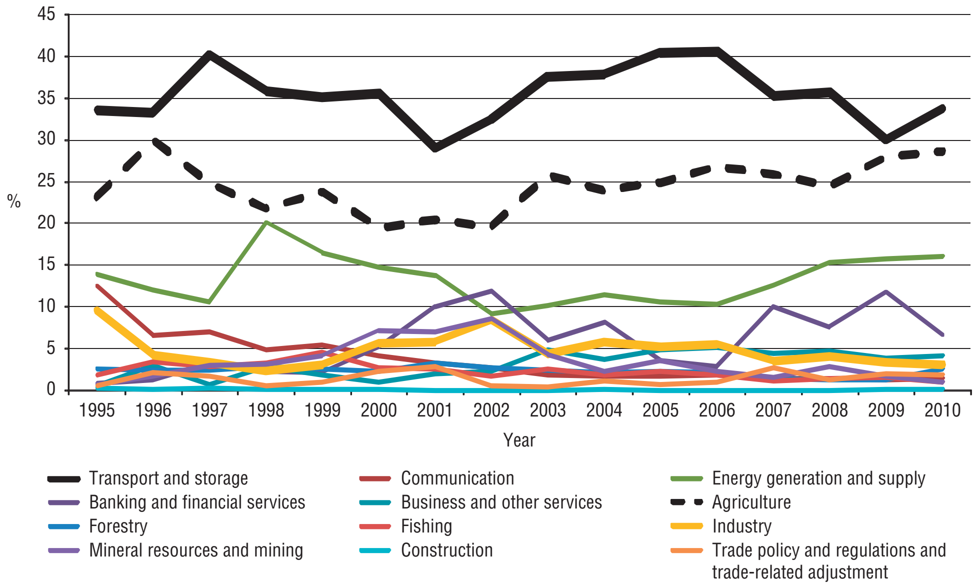
	2004	2005	2006	2007	2008	2009	2010	Total 1995-2010	Share 1995-2010
International Development Association	1,446.43	1,335.86	1,448.01	1,732.27	1,972.63	2,374.65	2,125.33	16,936.77	31.28
EU institutions	570.19	744.95	842.98	1,189.21	1,418.58	900.83	1,028.65	9,036.77	16.69
Japan	162.76	200.23	205.89	214.72	250.41	357.20	589.07	4,461.37	8.24
African Development Fund	451.77	295.58	273.64	304.17	463.91	915.97	737.50	4,143.01	7.65
France	197.78	168.29	169.46	458.46	326.32	193.95	233.47	3,333.53	6.16
Germany	190.71	166.14	168.63	248.45	325.19	246.87	191.58	2,951.52	5.45
USA	93.75	152.92	161.61	167.79	270.06	420.74	728.62	2,156.99	3.98
UK	66.95	65.66	74.73	394.66	261.96	278.16	265.66	1,810.04	3.34
Denmark	94.65	112.65	124.25	149.80	174.98	185.83	191.58	1,320.06	2.44
Sweden	71.61	76.70	98.10	91.94	123.86	80.81	88.44	1,201.02	2.22
Canada	36.97	58.45	56.75	69.20	82.81	137.12	313.51	1,028.35	1.90
Norway	77.25	70.16	79.59	119.22	150.16	165.22	167.46	991.69	1.83
Belgium	45.39	47.53	66.02	52.51	94.31	169.35	142.03	793.05	1.46
Spain	46.37	31.67	22.34	49.47	66.68	93.69	74.40	619.25	1.14
The Netherlands	37.40	40.91	40.81	85.94	71.59	80.68	35.59	595.43	1.10
Total	3,713.70	3,763.34	4,080.63	5,579.20	6,529.07	7,067.43	7,523.74	54,153.67	

and a few countries having similar shares of these two sectors. In the case of donor data, one striking element is that while some of the main donors, such as IDA, AfDB and Japan, have a similar distribution of AfT flows between the transport and agriculture sectors, other donors have specialised in either one or the other sector. For example, the EU's AfT is largely concentrated in transport, while some European bilateral donors or other countries such as Australia or Canada have largely specialised in the agriculture sector.

It is difficult to link this sector composition of AfT flows to structural change. Clearly, if these flows are effective, the large share of agriculture compared with industry in AfT assistance may indicate a bias towards increasing the share of agriculture production and productivity in the economy. However, the critical element for understanding the impact on structural change is whether the agricultural sector has increased its labour share. More importantly, most AfT flows are directed at transport, energy or services, finance or business development. Therefore, the final impact on structural change depends on whether these more sector-neutral interventions are having greater impacts on sectors of comparative advantage or on manufacturing.

Figure 2. Evolution of Aid for Trade and total aid flows by sub-Saharan African country 1995–2010 (logs)

Figure 3. Distribution of Aid for Trade by OECD DAC sector



5.2 Structural change in SSA

Estimating structural change is a difficult task given the lack of good data sources to estimate labour productivity by sector, and, more importantly, to determine sector labour shares. These data are rarely available for a significant number of economic sectors, countries and periods. As a result, it is important to complement the analysis with other measures that, despite not being a direct measure of structural change, can be informative whether structural change is likely to occur. One such indicator related to trade that may suggest that structural change is occurring is to look at the evolution of broad-sector export shares.

Figure 4 shows the evolution of export shares by country for agriculture, extractive industries and manufacture/industry sectors. The first element that emerges from Figure 3 is the heterogeneity of country experiences. This heterogeneity is summarised in Table 3 in relation to three dimensions: main export sector, large changes in sector export shares and dependency on specific sectors.

Regarding sector exports, the main export sector over the period 2005-10 was agriculture for eight countries, extractive industries, mainly oil, for 10 countries, and industry, mainly metals and stones, for 23 countries. Burundi and Djibouti had very similar shares of exports of agriculture and industry, and Rwanda of agriculture and the extractive sector.

Some countries appear to have very stable exports shares over time , for example, Malawi, Nigeria and Mauritius. In contrast, other countries have experienced significant sector export changes. In Table 3 those countries where the most important export sector has changed between the periods 1995–2000 and 2005-10 are

Figure 4. Aggregate sector export shares by sub-Saharan African country

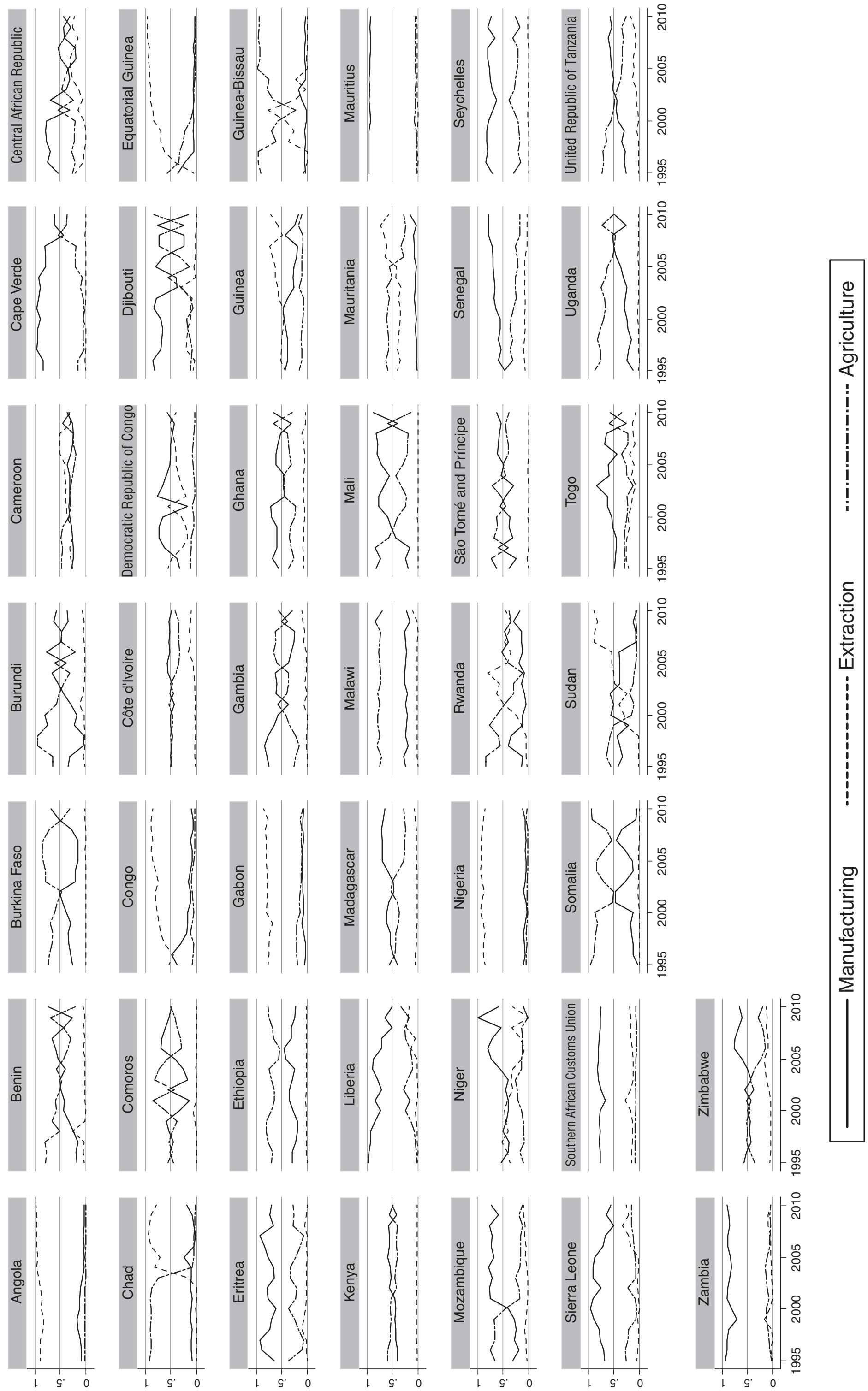


Table 3. Sector export shares

Country	Main sector[a]	Large sector changes[b]	Export concentration[c]
Burkina Faso	Agriculture		
Central African Republic	Agriculture		
Ethiopia	Agriculture		
Gambia	Agriculture	X	
Guinea-Bissau	Agriculture		X
Malawi	Agriculture		X
Somalia	Agriculture		X
Uganda	Agriculture	X	
Angola	Extraction		X
Cameroon	Extraction		
Chad	Extraction	X	X
Congo	Extraction		X
Equatorial Guinea	Extraction		X
Gabon	Extraction		X
Guinea	Extraction		
Mauritania	Extraction	X	
Nigeria	Extraction		X
Sudan	Extraction	X	X
Burundi	Agriculture/industry	X	
Djibouti	Agriculture/industry	X	
Rwanda	Agriculture/extraction	X	
Benin	Industry	X	
Cape Verde	Industry		
Comoros	Industry		
Côte d'Ivoire	Industry		
Democratic Republic of Congo	Industry		
Eritrea	Industry		X
Ghana	Industry		
Kenya	Industry		
Liberia	Industry		
Madagascar	Industry		
Mali	Industry	X	
Mauritius	Industry		X
Mozambique	Industry	X	

(continued)

Table 3. Sector export shares (continued)

Country	Main sector[a]	Large sector changes[b]	Export concentration[c]
Niger	Industry	X	
São Tomé	Industry	X	
Senegal	Industry		X
Seychelles	Industry		X
Sierra Leone	Industry		
Southern African Customs Union (SACU)	Industry		X
Togo	Industry		
Tanzania	Industry	X	
Zambia	Industry		X
Zimbabwe	Industry	X	

Notes: [a] Main export sector in the period 2005-10; [b] sector change in exports when there is a change in the main sector of exports between 1995-2000 and 2005-10; [c] export concentration when main export sector in period 2005-10 has more than 75 per cent export share.

identified. This might indicate structural change via changes in export shares that are affecting the production structure and employment allocation. In 15 cases there has been a significant export share reallocation across sectors. Interestingly, this occurs not only after the discovery of natural resources and the resultant export boom, but also from transitions from agriculture to industry.

The final dimension of heterogeneity explored in Table 3 is the concentration in specific export sectors. In 16 countries the main export sector during the period 2005-10 had a share larger than 75 per cent, which indicates a very narrow production base in many SSA countries. This large concentration occurs not only in oil-rich countries, but also in other countries exporting industrial goods. Furthermore, in all these cases, with the sole exception of Sudan, there have not been any significant sector changes during the period.

It is not straightforward to interpret what these results mean for structural change. In countries with large export concentration there is limited scope for structural change via trade. However, the narrow export base in these countries suggests that, as documented in the literature (Easterly and Reshef 2010), export booms can have large impacts on sector reallocations.

Significant changes in export structures are not common. In fact, when one looks at the sector composition of exports during the period 1995-99, this tends to be similar to the one over the period 2005-10. Table A1 in the appendix shows the correlation of sector export structures during three different 5-year period averages: 1995-99, 2000-04 and 2005-10. For most SSA countries, this correlation is very high, and only in the cases of Chad, Eritrea, Djibouti, Gambia and Mozambique is the correlation negative or close to zero, suggesting a very large change in sector export structure.

This lack of large changes in export structures is also observed in other regions of the world, as the world average correlation suggests. Across all countries in the world, the average correlation between sector composition of exports in 1995-99 and 2000-04 is 0.79. For SSA countries on average, this is still high but lower, around 0.71. This suggests that while large changes in export structures are unlikely, SSA shows less similarity between export structures over time compared to the world.

One critical element linking trade and structural change is whether there have been changes in the comparative advantage of countries over time. Significant changes in comparative advantage might indicate reallocation of resources across sectors. Conversely, if comparative advantage is reinforced over time, most productivity growth is likely to occur within the same sectors and little structural change will occur. Table A2 in the appendix shows the evolution of revealed comparative advantage (RCA)[4] for each SSA country for the period 1995–2010. Specifically, we calculate for each harmonised system (HS)-6-digit export product the RCA for each year, and construct the average for the periods 1995-2002 and 2003-10. Then, we use the change between the second period and the first, $RCA_{03\text{-}10}$-$RCA_{95\text{-}02}$, as our measure of whether RCA is reinforced over time. Since countries export a large number of products over time and only in some products is there RCA (>1), we classify products into four groups: the first group comprises those products with no RCA (RCA<1) and where this has increased over time (column 2, Table A2); the second group includes those products with no RCA (RCA<1) and where this has decreased over time (column 3, Table A2); the third group includes products with RCA (RCA>1) and where this has increased over time (column 4, Table A2); and group four includes products with RCA (RCA>1) and where this has decreased over time (column 5, Table A2). The table reports the number of products in each group. We define as reinforcing RCA when the number of product that increase RCA, columns (2) and (4), are larger than those where RCA decreases, columns (3) and (5). The percentage share difference is reported in column (7), and in column (8) it is reported only for those products having RCA>1. The final column shows the number of products exported during at least during 1 year in the period. This total number of products is larger than the products used for calculating RCA changes, given the fact that many products enter or exit export markets and, therefore, are not observed during the two periods.

4 The RCA for each country *i*, product *k* and year *t* is defined as the ratio between the export share of product *k* in the export basket of country *i* in period *t*, divided by the share of product *k* in world exports X^w.

$$RCA_{ikt} = \frac{x_{ikt} / \sum_k x_{ikt}}{\sum_i x_{kt} / X_t^w}$$

A country has revealed comparative advantage when the share of that product in the export basket is larger than the world share of the specific product, RCA>1. When RCA<1, the country does not possess revealed comparative advantage in that specific product.

Table A2 shows very mixed results. In the case of 23 countries there is a positive percentage share of products that experience an increase in RCA and in the case of 21 countries, most product lines experience a decrease in RCA. Figure 5 shows the probability distribution function of the percentage of product lines reinforcing RCA reported in column (7) of Table A2. The figure shows the large degree of heterogeneity in whether RCAs have been reinforced over time.

$$RCA_{ikt} = \frac{x_{ikt} / \sum_k x_{ikt}}{\sum_i x_{kt} / X_t^w}$$

A country has revealed comparative advantage when the share of that product in the export basket is larger than the world share of the specific product, RCA>1. When RCA<1, the country does not possess revealed comparative advantage in that specific product.

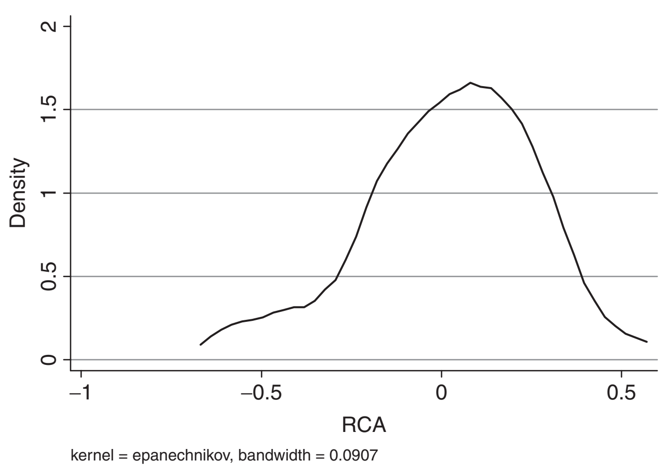
In order to further explore the evolution of structural change we calculate direct measures of structural change following the decomposition of labour productivity growth suggested by McMillan and Rodrik (2011). Specifically, increases is value added per worker, *VL*, can be decomposed in within sector changes (first term in equation 1) and between sector changes in employment shares (second term). This 'between'-sectors productivity change can be used as the structural change metric.

$$\Delta VL_t = \sum_{i=n} s_{it} \Delta VL_{it} + \sum_{i=n} \Delta s_{it} VL_{it} \quad (1)$$

In order to have a measure that we can extend to as many possible SSA countries and can be used for the econometric analysis, we estimate a simpler version, based on only two sectors, agriculture versus non-agriculture. This reflects a more traditional structural-change measure of reallocation away from agriculture, but also implies masking large within-sector heterogeneity in the non-agriculture sector.

One problem in calculating this measure is the lack of information sector

Figure 5. Kernel density estimate



employment shares. To overcome this problem we use two alternative methods. The first method uses information on value-added per worker, value-added, population and percentage of active population from the WDI to estimate employment shares. From the value-added and value-added per worker in agriculture series we derive the number of people employed in agriculture. Then, using the population series and percentage of active population we derive total employment and people employment in the non-agriculture sector; which is used to calculate sector employment shares each year.

The second method employed uses information on sector employment shares, also available in WDI. The problem of these series is that it only has information for most countries for 1 or 2 years. As a result, we have to extrapolate employment shares for the other years. For countries with more than one employment share observation we use linear extrapolation. For countries with only one observation we use the growth rates of the labour shares estimated in method 1 to extrapolate from the one observation. In general, we find that labour shares in agriculture in method 1 are significantly larger than in method 2. In cases where method 1 produces employment levels that are close to the overall population, we omit the calculation of the labour productivity growth decomposition.

Appendix Table A3 shows the results of the decomposition. These are summarised graphically in Figure 6. The yellow bars correspond to TFP growth, the red bars to the within sector growth component and the black bars to the between sector or structural change component. The horizontal lines correspond to the GDP weighted averages for method 1. Although most calculations correspond to growth from 1995 to 2010, in some cases the last period available in the data corresponded to earlier years.

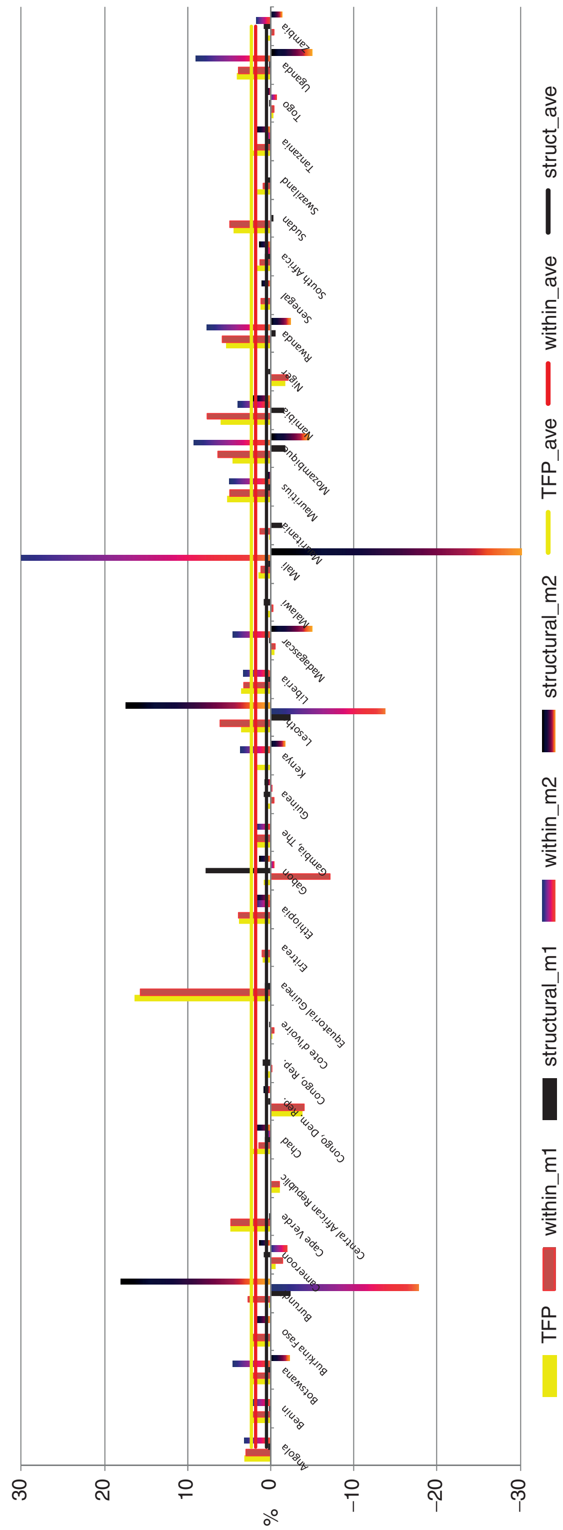
The weighted average labour productivity growth for SSA for the period was 2.31 per cent for method 1 and 2.11 per cent for method 2. This is low, but contrasts with the even lower labour productivity growth for the period 1990-2005 of 0.86 per cent in McMillan and Rodrik (2011). Labour productivity growth in our data is decomposed in 1.78 per cent (1.87 per cent method 2) within-sector growth and 0.45 per cent (0.33 per cent method 2) structural change; again in contrast with 2.13 per cent and -1.27 per cent in McMillan and Rodrik (2011).

The results are very sensitive to the number of sectors included, but also to the period and number of countries considered. In addition, there is considerable heterogeneity across countries. For example, in McMillan and Rodrik (2011), four out of the nine SSA countries considered experienced positive structural change.[5] In our sample, 12 out of the 37 countries considered experienced a negative contribution of structural change to labour productivity growth in method 1,[6] while for the remaining 25 countries, its contribution was positive.

5 Ethiopia, Ghana, Kenya and Mauritius.

6 Burkina Faso, Burundi, Central African Republic, Eritrea, Ethiopia, Lesotho, Mauritania, Mozambique, Namibia, Rwanda, Senegal and Sudan.

Figure 6. Structural change in sub-Saharan Africa



Overall, the descriptive data analysis in this section suggests significant heterogeneity of experiences in SSA regarding structural change. While export structures tend to be quite similar over time, some SSA countries appear to have experience significant changes while others have kept a very similar sector structure. This heterogeneity is also manifested when looking at direct measures of structural change.

In the following section we explore more in detail the relationship between AfT and structural change.

6. The impact of AfT on structural change

Following the conceptual framework described in section 3, we investigate the impact of AfT flows on structural change in two stages. In the first stage, we focus on the impact on trade flows and trade costs. In the second stage, we estimate whether AfT flows have a direct impact on structural change.

6.1 The impact of AfT on trade flows and trade costs

AfT flows aim to increase exports by reducing production, services and trade costs for firms.[7] Therefore, the first question we ask is whether AfT flows to Africa have been effective in achieving some of these outcomes.

6.1.1 Trade costs

We focus on two sets of trade costs. First, we use information from the UNESCAP-World Bank database, which provides information on bilateral costs between country pairs estimated using Novy's (2012) methodology derived for a structural gravity model. Novy (2012) derives trade costs between country pairs as:

$$\tau_{ijkt} = \left(\frac{x_{iikt} x_{jjkt}}{x_{ijkt} x_{jikt}} \right)^{\frac{1}{2(\sigma_k - 1)}} - 1 \qquad (2)$$

Where τ, the geometric average trade costs between countries i and j for sector k in period t, are a function of international trade flows x between i and j, intranational trade flows within i and j, and σ, the sector-specific elasticity of substitution between goods in the sector k. Trade costs include transport costs, tariffs and also other trade cost elements such as nontariff barriers. Specifically, in our analysis we use three different measures of aggregated trade costs: average total bilateral trade costs, average total bilateral trade costs excluding tariffs, and geometric average tariffs between country pairs.

7 AfT is almost always discussed in terms of exports rather than imports, even though access to the latter is every bit as important a benefit of trade as the former.

To estimate the impact of AfT on trade costs, we estimate the following reduced form equation:

$$\log(\tau_{ijt}) = \alpha_0 + \alpha_1 AFT\_tp_{ijt} + \alpha_2 AFT\_tr_{ijt} + \alpha_3 \log(S_{it}) + \alpha_4 \log(A_{jt}) + a_5 \log(Tot\_aid_{it}) + \lambda_{it} + u_{ijt} \quad (3)$$

Trade costs between bilateral pairs are a function of bilateral AfT flows. We focus on two AfT sectors that directly target trade costs in one way or another, transport costs and storage, *AFT_tr,* and trade policy and regulations, *AFT_tp*. Trade costs are also a function of supply production and export capacity *S*, proxied by the country's GDP; absorption in the recipient country *A*, proxied by GDP or GDP per capita in *j*; and total aid or AfT *Tot_aid*, since assistance from other donors is also likely to impact bilateral trade costs. Since AfT for transport and trade policy are zero for many pairs, we do not use the variables in logs.

The second set of trade costs used corresponds to specific country-level trade costs that are available from the WDI. Specifically, we focus on the country policy and institutional assessment (CPIA) index, measuring the quality of the trade policy framework; time to export and time to import, measuring the efficiency of customs procedures; and costs of exporting and importing a 20-foot container as a direct measure of trade costs. We use equation (4), a version of equation (3) that aggregates AfT flows for each SSA country *i* and considers only aggregate trade costs.

$$\log(\tau_{it}) = \alpha_0 + \alpha_1 AFT\_tp_{it} + \alpha_2 AFT\_tr_{it} + \alpha_3 \log(S_{it}) + \alpha_5 \log(Tot\_aid_{it}) + \lambda_{it} + u_{ijt} \quad (4)$$

Starting with bilateral trade costs, Table 4 shows the results of estimating equation (3) for bilateral pairs, SSA and donor countries, using bilateral pair fixed effects. The results do not show any statistically significant impact of AfT or aid flows on bilateral trade costs. AfT flows in transport and storage do not appear to impact bilateral trade costs significantly, and AFT flows in the trade policy and regulation category do not appear to have any statistically significant impact on bilateral trade costs or tariffs. The main significant impact found is related to supply capacity proxied by GDP, which, as expected, reduces trade costs.

It is likely that if bilateral aid flows have an impact, this is on trade costs in general rather than bilateral costs. As a result, we estimate equation (4) for aggregate trade costs. Table 5 shows the results of the fixed effects estimations. The number of observations is reduced considerably to around 200 observations, due to the lack of data availability regarding these indicators for SSA countries in some years. Most of the estimated coefficients do not appear to be statistically significant. Looking across specifications and the variables of interest, AfT flows do not have a statistically significant impact on the CPIA index of the quality of trade policy frameworks or the cost of exports. AfT flows directed to trade policy and regulations appear to reduce

Table 4. Fixed effects estimates of bilateral trade costs

	Log(tc) a			Log(geo_tar)b			Log(tc no tar)c		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
AfT_transp	**0.0008**	**0.0007**	**0.0007**	**0.0001**	**0.0001**	**0.0001**	**0.0006**	**0.0006**	**0.0005**
	(0.0008)	(0.0008)	(0.0008)	(0.0001)	(0.0001)	(0.0001)	(0.0008)	(0.0008)	(0.0008)
AfT_Tr_policy	-0.0008	-0.0012	-0.001	-0.0017	-0.0017	-0.0018	0.003	0.003	0.0035
	(0.0062)	(0.0063)	(0.0062)	(0.0014)	(0.0014)	(0.0014)	(0.0068)	(0.0069)	(0.0067)
Log(GDPi)	-0.2587***	-0.2729***	-0.2729***	0.024***	0.0235***	0.0235***	-0.3913***	-0.3967***	-0.3966***
	(0.0438)	(0.0437)	(0.0439)	(0.0044)	(0.0041)	(0.0041)	(0.0511)	(0.0496)	(0.0501)
Log(GDPj)	-0.1746	-0.1778		0.0359	0.0354		-0.3321*	-0.3333*	
	(0.1274)	(0.1278)		(0.0359)	(0.0356)		(0.179)	(0.1786)	
Log(GDP_capitaj)			-0.2222			0.0502			-0.4743**
			(0.1568)			(0.0424)			(0.2095)
Log(Tot AfT)	-0.0093*			-0.0014			-0.0041		
	(0.0055)			(0.0019)			(0.0063)		
Log (Tot Aid)		-0.0072	-0.0071		-0.0037	-0.0037		-0.0086	-0.0084
		(0.0075)	(0.0075)		(0.0032)	(0.0032)		(0.0094)	(0.0094)
Constant	15.9189***	16.3326***	13.7221***	-1.3908	-1.3497	-0.8946*	22.9584***	23.1392***	18.8188***
	(3.5806)	(3.5805)	(1.8078)	(1.0026)	(0.9796)	(0.4451)	(5.1037)	(5.0708)	(2.4459)
r2	0.0818	0.0807	0.0807	0.182	0.1848	0.1852	0.0852	0.0855	0.0866
N	4624	4625	4625	5390	5390	5390	3839	3839	3839

Notes: [a] log bilateral trade costs, [b] log geometric average tariff, [c] log bilateral trade costs excluding tariffs. * $p<0.1$, ** $p<0.05$, *** $p<0.01$. Year dummies and bilateral pair fixed effects.

the time for both exporting and importing, although these coefficients are only significant when we control for total aid.[8] A puzzling result in Table 5, however, is the effect of AfT flows in transport and storage on increasing the costs of importing a 20-foot container, which, in both specifications, controlling for total aid and total AfT, is statistically significant at a 95% confidence level.

Overall, the results do not suggest a statistically significant impact of AfT flows, bilateral or aggregate, on bilateral trade costs. The estimates on aggregate flows suggest only a positive impact of AfT flows directed to the trade policy and regulation on the time to export and import in some specifications. These results are in contrast with Cali and Te Velde (2011), who find a positive impact of AfT on aggregate indicators of the costs of trading. They also support the conclusions of Helble et al. (2009) which emphasise the greater effectiveness of AfT directed to trade policy and regulations.

Linking these results back to structural change, our results do not suggest a clear impact of AfT on reducing trade costs in SSA, which indicates that any structural changes occurring are likely to be driven primarily by other factors. We further explore this issue, by looking more directly at the impact of AfT flows on trade flows and structural change in the following sections.

6.1.2 Trade flows

There are several possible levels of aggregation to consider when exploring the impact of AfT on trade flows. First, as suggested in some of the literature reviewed, AfT flows may impact primarily bilateral flows between recipient and donor countries, especially if significant export opportunities are identified by donor countries or if interventions address trade costs that are country specific. Second, the impact may also occur on imports from donor countries, if, as above, trade costs are country specific or if one objective of aid allocation is to gain market access in recipient countries. Third, AfT flows include very different sectors and, therefore, it is possible that only productive sector-specific AfT flows affect specific sectors.

In order to include all these possibilities, we estimate a general gravity model for different levels of aggregation, sector trade and sector AfT. Gravity models have become a standard workhorse for assessing the determinants of trade between countries and the impact of different policy interventions. The typical structural gravity model is based on standard Dixit-Stiglitz style constant elasticity of substitution preferences and takes the following form:

$$X_{ij} = E_j Y_i \frac{P_j^{\varepsilon-1}}{\Omega_i} (1+\tau_{ij})^{1-\varepsilon} \qquad (5)$$

$$P_j = \left[\sum_{i=1}^{j} p_{ij}^{\;1-\varepsilon} \; (1+\tau_{ij})^{1-\varepsilon} \right]^{\frac{1}{1-\varepsilon}} \qquad (6)$$

$$\Omega_i = \sum_j E_j P_j^{\varepsilon-1} (1+\tau_{ij})^{1-\varepsilon} \qquad (7)$$

Where X_{ij} gives exports from country i to country j; E_j is total expenditure in

8 The positive role of aid directed towards trade policy and regulatory reform has also been emphasised by Helble et al. (2009), who found a significant impact of this type of AfT flows on trade.

Table 5. Fixed effects estimates of aggregate trade costs

	CPIA trade index		Log(Time to export)		Log(Time to import)		Log(cost export)		Log(cost import)	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
AfT_transp	0.0169	0.0177	-0.0033	0.0010	-0.0042	-0.0016	0.0136	0.0155	0.0117**	0.0114**
	(0.0265)	(0.0248)	(0.0059)	(0.0057)	(0.0096)	(0.0086)	(0.0086)	(0.0086)	(0.0051)	(0.0049)
AfT_Tr_policy	0.0242	0.0250	-0.0148	-0.0156**	-0.0237	-0.0246*	-0.0052	-0.0035	0.0001	0.0002
	(0.0179)	(0.0180)	(0.0074)	(0.0069)	(0.0145)	(0.0144)	(0.0090)	(0.0092)	(0.0065)	(0.0064)
Log(GDPi)	-0.8072	-0.8643	-0.4035	-0.2814	-0.7203*	-0.6245	-0.2058	-0.2615	-0.6854**	-0.6940**
	(0.5580)	(0.5543)	(0.2615)	(0.2756)	(0.4232)	(0.4210)	(0.4085)	(0.4054)	(0.3245)	(0.3291)
Log(Tot AfT)	0.0216		0.0246		0.0131		0.0235		-0.0015	
	(0.0892)		(0.0315)		(0.0279)		(0.0174)		(0.0247)	
Log (Tot Aid)		-0.0166		0.0653*		0.0490		-0.0177		-0.0045
		(0.0629)		(0.0337)		(0.0303)		(0.0172)		(0.0157)
Constant	21.5854*	22.9185*	12.2443**	9.2901	19.5209*	17.2135*	11.8883	13.1593	22.9617***	22.8959***
	(12.5007)	(12.2819)	(5.9137)	(6.2417)	(9.4874)	(9.3954)	(9.1365)	(8.9751)	(7.2122)	(7.2935)
r2	0.0781	0.07717	0.35315	0.38885	0.42639	0.44068	0.44062	0.43787	0.59454	0.59478
N	171	171	201	201	201	201	201	201	201	201

Notes: * p<0.1, ** p<0.05, *** p<0.01. Year dummies and country fixed effects.

country *j*; the value of output in the exporting country is given by Y_i; and Y_{ij} represents the bilateral costs of trading between i and j. P_j and Ω_j, respectively, are what Anderson and van Wincoop (2003) referred to as the inward and outward multilateral resistance terms. These can be interpreted as representing the average trade costs faced by the buyers (inward) and sellers (outward). P_j is the price index in country *j*, with P_{ij} being the price of the good being exported from *i* to *j*, and ε is the elasticity of substitution parameter. Therefore, exports from *i* to *j* depend on activity levels in both countries (consumption or GDP in country *j*, production or GDP in country *i*), trade costs between *i* and *j* and the price index in country *j*, relative to the price indices in all other countries.

Standard gravity models frequently assume a variety of possible trade costs measuring geographical and cultural proximity such as distance (Dist), common border (Border), common language or colonial ties, as well as variables related to specific trade agreements or preferences (Pref), or to the associated tariffs. These tend to be included in additive form (see, for example, Anderson and Yotov, 2012; Baier and Bergstrand, 2009). Therefore, in order to include the impact of AfT on trade flows, we add AfT as a determinant of these trade costs, as in equation (6), as the main objective of these programmes is to reduce trading costs.

$$\tau_{ij}^{1-\varepsilon} = e^{\alpha_1 Dist_{ij} + \alpha_2 Border_{ij} + \alpha_3 AfT_{ij} + ... + \alpha_n Tariff_{ij}} \quad (8)$$

The literature tends to use GDP levels to control for export supply and consumption. In addition, to control for multilateral resistance indices one needs to employ country-pair fixed effects. One problem with using country-pair fixed effects is that does not allow the identification of any time-invariant trade costs, such as distance. In addition, identifying the impact of trade policy on these flows is also problematic, since we are focusing only on trade flows from SSA to OECD and emerging markets. SSA countries have enjoyed preferential access to OECD markets via the different generalised system of preferences regimes for more than two decades. This implies that tariffs on SSA exports have been very stable over time and very similar across countries; hence they are captured by the pair fixed effects. Regarding the main variable of interest, AfT, however, we can exploit the time variation in order to identify its impact on trade.

Specifically, we estimate equation (9). In order to use all the information available for SSA and donor countries, and avoid sample selection,[9] we include observations with zero trade flows or zero AfT flows. This implies, however, that we cannot estimate equation (9) in logarithm form. In addition, if AfT or aid flows affect trade, we need to control for the possible impact of AfT and aid from other donors on bilateral trade. For example, road rehabilitation from other donors is likely to impact exports to donor *j*. Therefore, we use two different specifications: one that uses total AfT

9 However, we do not include bilateral trade between SSA and all other non donor countries. If there are determinants of becoming a donor that affect bilateral trade, those could still bias the estimated coefficients.

flows from all donors, bilateral and multilateral, and one that uses total aid from all donors. Finally, in order to control for world demand shocks we use year dummies.

$$X_{ijt} = \beta_0 + \beta_1 GDP_{it} + \beta_2 GDP_{jt} + \beta_3 AfT_{jti} + \beta_4 Tot\_Aid_{it} + \lambda_{ij} + \lambda_t + e_{ijt} \quad (9)$$

In addition, to test the impact of AfT on bilateral trade, we also analyse the impact on aggregate trade. Many bilateral AfT programmes are country-neutral in the sense that they aim at reducing trade costs and increasing exports in general. This is not captured by equation (9) and, therefore, we also estimate an aggregated version that collapses the bilateral dimension to include only aggregate recipient country variables, as in equation (10).

$$X_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 Tot\_AfT_{it} + \lambda_i + \lambda_t + e_{it} \quad (10)$$

One potential problem for both equations (9) and (10) is that aid allocations might be endogenous to trade when donors have mercantilist aims or when it is allocated to countries with a larger trade potential. As a result, in addition to estimating equation (9) using panel pair fixed effects, we also estimate it using instrumental variables and by the generalised method of moments (GMM) using lagged values of AfT. We base the choice of instruments on the literature of aid allocation rules, and use population to control for size, GDP per capita to control for income level, United Nations similar voting to control for political affinity and natural resource rents and trade shares (exports and imports) to control for mercantilist interests. In equation (10) we employ the same instruments, but use for each SSA country the weighted average of these variables with all donors.

Finally, as suggested above, we look at different export and AfT sectors. For exports these include total exports, total imports, agriculture exports, fishing exports, mining exports, wood exports and industrial exports. For AfT flows, they include total AfT, AfT in agriculture, AfT in fisheries, AfT in forestry, AfT in mining and AfT in industry.

Table 6 shows the main estimates of the impact of aggregate AfT flows on bilateral exports, imports and sector exports. Since we look at the impact of bilateral aid flows, our dataset is limited to donor countries with information available, which to our knowledge excludes only China among significant donors. As suggested above, for this set of donors we look at flows to SSA countries and also include flows as zero when there is no bilateral AfT or trade flows. We estimate equation (9) in linear form and also add to the fixed effects, instrumental variables and GMM estimates fixed-effects Poisson (quasi-ML) estimates in order to better handle zero trade flows.

Focusing on the main variables of interest, the impact of AfT flows, the results are rather puzzling. Bilateral AfT has no statistically significant impact on bilateral exports, agricultural exports, mineral exports or manufacturing exports. However, when AfT flows are instrumented to correct for potential endogeneity of AfT flows to the level of exports, the coefficient becomes negative

Table 6. Estimates of bilateral trade flows

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	FE1	**FE2**	**POI1**	**POI2**	**IV1**	**IV2**	**GMM1**	**GMM2**
Exports								
gdp_00	0.00561***	0.00548***	-7.23e-07	-9.04e-07*	0.0567***	0.0664***	0.00505***	0.00488***
	(0.00112)	(0.00111)	(5.21e-07)	(4.83e-07)	(0.0105)	(0.0102)	(0.000934)	(0.000983)
gdp_00p	0.000372*	0.000372*	1.40e-07**	1.39e-07**	0.000711***	0.000715***	0.000853***	0.000862***
	(0.000193)	(0.000193)	(6.02e-08)	(6.24e-08)	(0.000221)	(0.000131)	(9.55e-05)	(9.43e-05)
AfT	2.153	2.318	-0.00312***	-0.00291**	-162.2**	-163.8***	14.69	16.79
	(2.123)	(2.130)	(0.00114)	(0.00114)	(82.00)	(40.54)	(10.12)	(11.48)
total_AfT	0.199		0.000514		1.111		0.175*	
	(0.169)		(0.000312)		(0.788)		(0.105)	
tot_aid		0.0318		1.32e-05*		0.0295		0.0330***
		(0.0229)		(6.79e-06)		(0.0236)		(0.0103)
Observations	16331	16331	18272	18272	15805	15805	16072	16072
R-squared	0.111	0.113						
Number of i	1161	1161	1142	1142	1040	1040	1148	1148
Imports								
gdp_00	0.00398***	0.00393***	-4.88e-07	-7.50e-07*	0.0223***	0.0260***	0.00314***	0.00306***
	(0.000773)	(0.000776)	(3.96e-07)	(3.93e-07)	(0.00245)	(0.00282)	(0.000823)	(0.000829)
gdp_00p	6.25e-05***	6.18e-05***	-6.41e-08	-6.23e-08	0.000157***	0.000162***	8.91e-05**	9.42e-05***
	(2.37e-05)	(2.35e-05)	(5.38e-08)	(5.51e-08)	(4.76e-05)	(3.60e-05)	(3.52e-05)	(3.65e-05)
AfT	3.077**	3.346**	-0.00281***	-0.00231**	-45.26**	-47.76***	12.81***	13.31***
	(1.506)	(1.458)	(0.000879)	(0.000933)	(20.83)	(13.33)	(4.400)	(4.493)
total_AfT	0.150***		0.000668***		0.361*		0.0115	
	(0.0489)		(0.000174)		(0.204)		(0.0236)	
tot_aid		0.0120***		7.40e-06		0.00711		0.00378**
		(0.00324)		(4.96e-06)		(0.00528)		(0.00154)

(continued)

Table 6. Estimates of bilateral trade flows

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	FE1	**FE2**	**POI1**	**POI2**	**IV1**	**IV2**	**GMM1**	**GMM2**
Observations	17498	17498	18320	18320	15805	15805	16072	16072
R-squared	0.261	0.260						
Number of i	1168	1168	1145	1145	1040	1040	1148	1148
Agriculture exports								
gdp_00	0.000196***	0.000191***	1.14e-06*	6.22e-07	0.000316**	0.000298**	0.000191***	0.000192***
	(7.23e-05)	(7.25e-05)	(6.11e-07)	(6.03e-07)	(0.000124)	(0.000138)	(6.84e-05)	(6.81e-05)
gdp_00p	3.47e-06	3.22e-06	6.17e-08	5.33e-08	1.73e-06	-3.72e-07	3.70e-06	3.84e-06
	(2.79e-06)	(2.79e-06)	(7.08e-08)	(6.49e-08)	(2.69e-06)	(1.85e-06)	(4.10e-06)	(4.02e-06)
AfT	0.135	0.187*	-0.00184	-0.000760	1.028	1.949***	0.345	0.413
	(0.109)	(0.107)	(0.00120)	(0.00125)	(1.088)	(0.629)	(0.281)	(0.285)
total_AfT	0.0236***		0.00110***		0.00975		0.00166	
	(0.00481)		(0.000209)		(0.0108)		(0.00322)	
tot_aid		0.000690***		2.58e-05**		-0.000126		-7.11e-05
		(0.000250)		(1.12e-05)		(0.000269)		(9.39e-05)
Observations	13308	13308	17280	17280	15805	15805	16072	16072
R-squared	0.088	0.081						
Number of i	1093	1093	1080	1080	1040	1040	1148	1148
Extractive exports								
gdp_00	0.00105**	0.000829**	-2.68e-06***	-2.61e-06***	0.0532***	0.0612***	0.00245***	0.00221***
	(0.000467)	(0.000367)	(1.03e-06)	(1.01e-06)	(0.00983)	(0.00948)	(0.000712)	(0.000701)
gdp_00p	0.000504	0.000504	7.04e-09	7.93e-09	0.000644***	0.000649***	0.000882***	0.000872***
	(0.000324)	(0.000322)	(8.08e-08)	(7.81e-08)	(0.000205)	(0.000121)	(0.000106)	(9.68e-05)

(continued)

Table 6. Estimates of bilateral trade flows (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	FE1	**FE2**	**POI1**	**POI2**	**IV1**	**IV2**	**GMM1**	**GMM2**
AfT	-1.439	-1.048	-0.00336	-0.00397	-143.1*	-145.4***	12.31	14.94
	(1.572)	(1.762)	(0.00285)	(0.00299)	(75.10)	(37.38)	(8.903)	(10.30)
total_AfT	0.449		-0.000247		0.905		0.269	
	(0.433)		(0.000511)		(0.720)		(0.165)	
tot_aid		0.0651		8.83e-06		0.0244		0.0346***
		(0.0423)		(9.75e-06)		(0.0220)		(0.0117)
Observations	5718	5718	12432	12432	15805	15805	16072	16072
R-squared	0.079	0.084						
Number of i	779	779	777	777	1040	1040	1148	1148
Manufacturing exports								
gdp_00	0.00404***	0.00405***	9.06e-07	3.97e-07	0.00319***	0.00488***	0.00328***	0.00328***
	(0.00100)	(0.00101)	(6.90e-07)	(6.47e-07)	(0.000878)	(0.000995)	(0.000770)	(0.000713)
gdp_00p	6.24e-05*	6.24e-05*	2.50e-08	2.78e-08	6.51e-05***	6.54e-05***	0.000149***	0.000151***
	(3.77e-05)	(3.77e-05)	(4.72e-08)	(4.94e-08)	(2.22e-05)	(1.48e-05)	(3.70e-05)	(3.29e-05)
AfT	2.533	2.525	-0.00243**	-0.00191*	-20.16**	-20.29***	4.340	4.232
	(1.741)	(1.700)	(0.00101)	(0.000985)	(9.587)	(5.501)	(4.239)	(4.200)
total_AfT	-0.0110		0.00174***		0.197**		0.0154	
	(0.0340)		(0.000527)		(0.0929)		(0.0178)	
tot_aid		-0.00186		2.45e-05		0.00522**		0.000839
		(0.00249)		(1.84e-05)		(0.00239)		(0.000787)
Observations	15601	15601	18192	18192	15805	15805	16072	16072
R-squared	0.253	0.253						
Number of i	1153	1153	1137	1137	1040	1040	1148	1148

Note: robust standard errors in parentheses; * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Table 7. Estimates of aggregate trade flows

	Log(exports)						Log(imports)					
	FEa	FEb	IVREG1a	IVREG1b	BONDa	BONDb	FEa	FEb	IVREG1a	IVREG1b	BONDa	BONDb
Log(gdp)i	1.4221***	1.2101***	1.2659***	0.9053***	0.7595	0.889	0.7605***	0.6376***	0.6613***	0.4857***	0.5877	0.4845
	(0.2024)	(0.2649)	(0.1085)	(0.1675)	(2.7853)	(5.632)	(0.0801)	(0.1324)	(0.0835)	(0.1125)	(2.4444)	(2.9701)
Log(gdp)w_j	-0.0712	-0.1396	-0.3357***	-0.4489***	-0.1937	-0.1747	-0.0734*	-0.1084*	-0.0614*	-0.1274***	-0.1255	-0.1361
	(0.2016)	(0.2178)	(0.0768)	(0.0903)	(0.7822)	(0.7702)	(0.0391)	(0.0552)	(0.0331)	(0.0426)	(0.9645)	(0.968)
Log(AfT)	-0.0228		0.117		0.018	-0.0286	0.0202		0.0418		0.0154	0.032
	(0.0404)		(0.0638)		(0.184)	(0.3511)	(0.017)		(0.0473)		(0.5704)	(0.6505)
Log(Aid)		0.0001		0.4584***		0.058		0.0479**		0.1348		-0.0274
		(0.0544)		(0.1417)		(0.692)		(0.0243)		(0.1105)		(0.3155)
_cons	-3.7888	-1.1686			1.0747	-0.8249	1.748	3.0907			2.8156	3.8825
	(3.7162)	(4.3729)			(19.9266)	(41.0181)	(0.9194)	(1.5921)			(37.3559)	(35.6578)
r2	0.6276	0.5968	0.5916	0.4536			0.8421	0.8343	0.8468	0.8381		
N	650	657	528	533	568	568	650	657	528	533	568	568

Note: robust standard errors in parentheses; * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Table 8a. Estimates of the impact of sector Aid for Trade flows on sector exports

	Agricultural exports			Fish exports		
	FE	IVREG1	BOND	FE	IVREG1	BOND
Log(gdp)i	-10.1675	124.1567	-39.6330	-2.5157	-2.9821	-18.3535
	(47.5470)	(91.7733)	(3900.0000)	(12.2804)	(16.5513)	(272.062)
Log(gdp)w_j	-7.1865	-49.4275	12.1553	-9.6395*	-14.9362	-9.8285
	(19.3235)	(38.6103)	(3000.0000)	(4.3583)	(10.2475)	(35.5049)
Log(AfT_sectork)	1.7478**	-4.0309	0.5123	2.4245	19.2758	0.989
	(0.6608)	(2.7717)	(29.4591)	(1.534)	(26.1371)	(7.5386)
_cons	345.2193		143.4577	195.7844*		286.8573
	(371.6978)		(18000.0000)	(94.1883)		(2.00E+03)
r2	0.1752	-0.569		0.1058	-1.1289	
N	657	533	574	657	533	574

Note: robust standard errors in parentheses; ***: p<0.01, **: p<0.05, *: p<0.1.

and statistically significant, which implies that bilateral AfT flows reduce bilateral exports. In the case of bilateral imports, the coefficients are positive and statistically significant, but again when bilateral AfT is instrumented, they turn negative and statistically significant.

Considering the impact of total AfT flows and total aid flows on bilateral trade also shows mixed results. In most specifications the coefficients on aggregate aid flows are positive but not statistically significant. In the case of imports, total AfT flows are positive and statistically significant in most cases, except in specifications where bilateral AfT flows are instrumented. The same occurs to the coefficient on total aid flows, although the GMM specification suggests a positive and statistically significant impact on imports and on manufacturing exports for the instrumented specification.

Overall, the results do not show much evidence of a positive impact of bilateral AfT flows on bilateral trade; AfT flows are likely to be endogenous to trade flows and the impact, if any, might be to diversify trade to other sources. The impact of aggregate aid flows is most significant on increasing imports, but it is not robust.

Most AfT interventions probably do not target bilateral trade opportunities, so the results described could still be consistent with successful policy and with an overall positive impact on trade. In order to address this issue, we estimate equation (10) for aggregated trade flows. Table 7 shows the main estimated coefficients. In addition to the impact on aggregate exports and imports, we also report in Table 8 the estimates of the impact of sector AfT flows on sector exports. For example, for the impact on agricultural exports we use AfT flows in the agriculture sector or for the impact on fish exports we use AfT flows to fisheries. We also use a weighted average of partner countries' GDP to proxy for changes in absorption capacity of main export markets.

Table 8b. Estimates of the impact of sector Aid for Trade flows on sector exports

	Wood exports			Extractive exports			Industry exports		
	FE	IVREG1	BOND	FE	IVREG1	BOND	FE	IVREG1	BOND
Log(gdp)i	3.9242	17.8106***	-10.6011	4.40E+03	2000***	8.90E+03	-5.40E+02	-1.10E+02	4.60E+03
	(10.0402)	(6.1371)	(1400.0000)	(2.70E+03)	(521.974)	(7.40E+09)	(700.9152)	(141.2543)	(9.40E+07)
Log(gdp)w_j	-2.8372	-10.6287*	-4.3096	104.7958	446.4211***	3.20E+03	-2.80E+02	-300***	-1.70E+02
	(6.6914)	(4.4437)	(296.7032)	(741.7833)	(194.2473)	(2.70E+09)	(246.7075)	(111.379)	(2.00E+07)
Log(AfT_sectork)	0.1005	-4.4944	-0.2674	83.3472	17.6538	17.6539	67.9386	101.2583***	25.1111
	(0.5432)	(4.8635)	(21.5614)	(84.7399)	(86.3754)	(4.80E+07)	(60.776)	(42.2829)	(2.30E+06)
_cons	73.4117		177.0681	-3.50E+04		-1.20E+05	9.00E+03		-3.40E+04
	(94.6257)		(6500.0000)	(1.90E+04)		(3.50E+10)	(4.10E+03)		(4.40E+08)
r2	0.1107	-0.0289		0.1479	0.093		0.0919	-0.2194	
N	657	533	574	657	533	574	657	533	574

Again, the results show a general lack of significant results, suggesting a positive impact of AfT on trade. Looking at the preferred IV regressions, only total aid seems to have a positive impact on exports, but when correcting for endogeneity using the GMM estimator, the coefficient is not statistically significant. Regarding the sector specifications, only AfT flows directed to industry appear to have a significant impact increasing industrial exports. Again, however, this coefficient is not statistically significant when using GMM.

Based on the different estimates described for trade flows and also for trade costs, it is difficult to conclude that there is significant evidence that AfT interventions are having any statistically significant impact on trade. As a result, it is difficult to link AfT programmes to structural change, given the fact that changes in trade flows and trade costs are the main channels of causation from AfT programmes to structural change. This implies that any structural changes occurring in SSA are likely to be explained by other factors, external to AfT. Nonetheless, in order to further explore the link between AfT and structural change, the following section analyses the direct link between AfT programmes and structural change in a little more detail.

6.2 AfT and structural change

We use the between component of the labour productivity growth equation (1) as our first measure of structural change. We calculate the decomposition in equation (1) from one 3-year period to another[10]: 1995-97, 1998-2000, 2001-03, 2004-06, 2007-10, and use the two different labour shares series described in section 5.2. As emphasised earlier, we are

10 We have also replicated the same empirical exercise for 1-year changes and found very similar results.

Table 9. Fixed effects estimates of structural change regressions

	Structural 1			Structural2			RCA change		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
ltotal_AfT	-0.0326			0.00611			-54.56		
	(0.0546)			(0.0215)			(72.46)		
ltot_aid		0.0614			0.0509			19.45	
		(0.0685)			(0.0485)			(71.34)	
AfT_transport			-2.83e-05			0.000780			-3.263
			(0.000724)			(0.000563)			(2.574)
AfT_agricult			7.92e-05			-0.00134			3.774
			(0.000554)			(0.000949)			(3.808)
AfT_Tr_policy			0.00243			0.0121			-3.257
			(0.00281)			(0.0108)			(7.407)
lnat_res_rent	-0.187	-0.157	-0.193	0.0324	0.0442	-0.00319	-72.63	-92.02	-224.0
	(0.153)	(0.140)	(0.163)	(0.0536)	(0.0603)	(0.0685)	(144.2)	(151.5)	(231.6)
labour	-0.348	-0.470	-0.453	1.900	1.712	1.111	9783	9171	8939
	(1.389)	(1.414)	(1.435)	(2.183)	(1.925)	(1.000)	(8685)	(8175)	(8168)
lgdp_00	0.870	0.879	0.860	0.110	0.132	0.357	-776.9	-909.2	-860.0
	(0.841)	(0.847)	(0.922)	(0.194)	(0.185)	(0.304)	(794.4)	(936.2)	(946.5)
Lopen	0.305	0.180	0.260	-0.155	-0.185	-0.189	-456.7	-258.2	20.30
	(0.280)	(0.199)	(0.273)	(0.203)	(0.223)	(0.216)	(678.1)	(482.2)	(383.7)
ler_ppp	0.405	0.354	0.368	-0.0213	-0.0287	-0.0690	-291.5	-299.2	-45.98
	(0.380)	(0.332)	(0.404)	(0.0764)	(0.0812)	(0.122)	(466.6)	(447.3)	(378.9)
Constant	-6.183	-6.657	-6.101	-3.451	-3.686	-4.376	-2748	-1249	-1171
	(7.192)	(7.672)	(8.026)	(2.280)	(2.497)	(3.476)	(4338)	(3257)	(3160)
Observations	123	123	123	87	87	87	189	190	190
R-squared	0.072	0.073	0.072	0.062	0.067	0.211	0.070	0.067	0.080
Number of i	33	33	33	23	23	23	38	38	38

Note: robust standard errors in parentheses; ***: p<0.01, **: p<0.05, *: p<0.1.

only using the labour productivity growth component that is explained by shifting labour from agriculture to the non-agriculture sector. Then, we regress the structural change measure on a set of explanatory variables in logs that include: GDP to control for the size and income of the economy; AfT flows; a set of variables to control for endowments that include labour (L) and natural resource rents (NR); the degree of openness in the economy (OPEN); a measure of the real exchange rate that is the ratio of the nominal exchange rate to the purchasing power parity adjustment factor; and a set of country fixed effects and period dummies. Countries with large endowments in natural resources and labour are likely to shift resources away from agriculture to the non-agriculture sector with a positive impact on structural change and labour. Also, real exchange rate depreciation is likely to impact more positively the manufacturing sector and facilitate structural change. Finally, more open economies in the region are likely to experience larger reallocation of resources to comparative advantage sectors; therefore, the sign of the coefficient depends on the economic structure of the country.

$$\begin{aligned} S_{it} = \beta_0 + \beta_1 \log(GDP_{it}) \\ + \beta_2 \log(AfT_{it}) + \beta_3 \log(L_{it}) \\ + \beta_4 \log(NR_{it}) + \beta_5 \log(ER_{it}) \\ + \beta_6 \log(OPEN)_{it} + \lambda_i + \lambda_t + e_{it} \end{aligned} \tag{11}$$

Table 9 shows the estimates of the fixed-effect regressions with robust standard errors. The coefficients of interest regarding the impact of AfT, aid and sector AfT flows are not statistically significant. In fact, none of the variables are statistically significant in explaining the variation in structural change.

As a final robustness check, we replace the dependent variable by a weighted average of the year-to-year change averaged for each 3-year period for each product RCA and each country, and analyse whether AfT flows are strengthening or changing comparative advantage. The results are not statistically significant, suggesting that AfT flows have no impact on changing comparative advantage.

7. Conclusions and policy implications

Traditional economic development models after Lewis emphasise the role of structural change in the process of economic development. As countries develop, labour is reallocated from agriculture to other sectors with higher productivity, resulting in an increase in people's standard of living. The large concentration of SSA exports in primary commodities and its significant export growth in the last decade raises the question of whether this process is taking place in African countries. More importantly, the large increase in aid flows directed to facilitate trade questions whether these assistance flows are, in practice, facilitating structural change towards sectors with comparative advantage, which in SSA countries tend to be sectors of lower productivity.

In this paper we investigated empirically whether there is any evidence that these flows are having any impacts on structural change in the region. The results show that there is great heterogeneity regarding structural change experiences and comparative advantage. In some countries the contribution of labour sector reallocation to labour productivity growth is positive, while in others it is negative, and there is no clear pattern.

More importantly, when analysing whether AfT flows have had any impact on this process, we could not find any significant results. A necessary condition for AfT flows to impact structural change is to first have an impact on the trade structure of the country. We look at the impact of AfT flows on trade costs, aggregate trade flows, bilateral trade flows and sector trade flows and we cannot find any statistically significant impacts, with the exception of AfT programmes on trade policy and regulations reducing the time to export and import. When looking directly at the impact on structural change indicators we also cannot find any statistically significant impacts.

Overall, it appears that factors other than AfT explain the different experiences in relation to structural change in SSA. This is not surprising, since other structural factors are likely to play the main role in determining this process. However, more worrying is the lack of impact of AfT flows on trade costs and trade flows, which contrasts with some of the previous literature that found a positive link.

Appendix

Table A.1 Correlation of export structures

	Correlation 1995-99 to 2005-10	Correlation 1995-99 to 2000-04	Correlation 2000-04 to 2005-10
Angola	0.9964	0.9992	0.9989
Benin	0.6921	0.9814	0.7824
Burkina Faso	0.7883	0.9805	0.7140
Burundi	0.9605	0.9491	0.9705
Cameroon	0.8760	0.9489	0.9811
Cape Verde	0.5828	0.5508	0.4701
Central African Republic	0.7158	0.9555	0.8831
Chad	-0.0656	0.1923	0.9662
Comoros	0.7870	0.8572	0.8131
Congo	0.9216	0.9344	0.9979
Côte d'Ivoire	0.8776	0.9849	0.9199
Dem. Rep. Congo	0.4340	0.9613	0.5413
Djibouti	0.0311	0.6373	0.5556
Equatorial Guinea	0.9439	0.9562	0.9991
Eritrea	-0.1779	0.0839	0.2099
Ethiopia	0.9860	0.9970	0.9792
Gabon	0.9953	0.9976	0.9996
Gambia	0.0155	0.2121	0.9431
Ghana	0.9491	0.9596	0.9327
Guinea	0.9535	0.9930	0.9785
Guinea-Bissau	0.7361	0.7416	0.8260
Kenya	0.9928	0.9760	0.9790
Liberia	0.6331	0.6814	0.9579
Madagascar	0.8906	0.9923	0.9266
Malawi	0.9965	0.9995	0.9980
Maldives	0.6481	0.8994	0.3718
Mali	0.4823	0.6815	0.9685
Mauritania	0.8282	0.9997	0.8345
Mauritius	0.9798	0.9974	0.9760
Mozambique	-0.0568	0.0325	0.9635
Niger	0.8331	0.9796	0.8462
Nigeria	0.9999	0.9999	1.0000
Rwanda	0.7013	0.3680	0.9082

(continued)

Table A.1 Correlation of export structures (continued)

	Correlation 1995-99 to 2005-10	Correlation 1995-99 to 2000-04	Correlation 2000-04 to 2005-10
Senegal	0.7864	0.9637	0.8848
Seychelles	0.9845	0.9335	0.9678
Sierra Leone	0.7823	0.8386	0.7408
Somalia	0.9813	0.9330	0.9603
Southern African Customs Union (SACU)	0.9817	0.9858	0.9745
Sudan	0.0164	0.0739	0.9981
Togo	0.8647	0.9375	0.8090
Uganda	0.9333	0.9456	0.9779
Tanzania	0.4975	0.5934	0.9469
Western Sahara	0.7347	0.0898	0.4182
Zambia	0.9958	0.9972	0.9933
Zimbabwe	0.6915	0.9885	0.7348
SSA average	0.7151	0.7947	0.8577
World average	0.7899	0.8764	0.8566
World average without SSA	0.8072	0.8939	0.8568

Table A.2 Evolution of revealed competitive advantage (RCA) between 1995–2002 and 2003–10

	No RCA (RCA<1) Increasing ΔRCA>0	No RCA (RCA<1) Decreasing ΔRCA<0	RCA (RCA>1) Increasing ΔRCA>0	RCA (RCA>1) Decreasing ΔRCA<0	% RCA reinforced (2)+(4)-(3)-(5)/ (2)+(3)+(4)+(5)	% RCA reinforced (RCA>1) (4)-(5)/(4)+(5)	Total exported products
	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Angola	357	556	3	22	-23.24	-76.00	2,064
Benin	518	493	76	224	-9.38	-49.33	2,662
Burkina Faso	643	626	107	385	-14.82	-56.50	3,117
Burundi	233	125	58	98	13.23	-25.64	1,649
Cameroon	1,428	898	65	135	18.21	-35.00	3,748
Cape Verde	484	185	109	225	18.25	-34.73	2,191
Central African Republic	415	175	52	95	26.73	-29.25	2,031
Chad	69	225	8	63	-57.81	-77.46	1,266
Comoros	195	104	41	106	5.83	-44.22	1,349
Congo	296	517	20	60	-29.23	-50.00	2,051
Côte d'Ivoire	1,383	1,501	90	229	-8.02	-43.57	4,292
Democratic Republic of Congo	524	420	37	56	8.20	-20.43	2,396
Djibouti	190	184	117	405	-31.47	-55.17	2,234
Equatorial Guinea	63	157	1	25	-47.97	-92.31	942
Eritrea	154	53	105	172	7.02	-24.19	1,645
Ethiopia	759	474	120	178	14.83	-19.46	2,946
Gabon	752	778	24	50	-3.24	-35.14	2,855
Gambia	602	125	180	151	47.83	8.76	2,438
Ghana	1,732	998	110	209	20.83	-31.03	4,163
Guinea	581	396	56	95	12.94	-25.83	2,467
Guinea-Bissau	109	45	27	37	24.77	-15.63	900
Kenya	2,304	1,321	308	432	19.68	-16.76	4,825
Liberia	334	244	22	52	9.20	-40.54	1,892
Madagascar	1,408	553	254	310	31.64	-9.93	3,673
Malawi	1,027	545	123	231	19.42	-30.51	3,284
Mali	877	744	61	240	-2.39	-59.47	3,244
Mauritania	299	368	39	95	-15.61	-41.79	1,875
Mauritius	2,313	698	270	353	42.16	-13.32	4,387
Mozambique	728	811	74	320	-17.02	-62.44	3,243

(continued)

Table A.2 Evolution of revealed competitive advantage (RCA) between 1995–2002 and 2003–10 (continued)

	No RCA (RCA<1) Increasing ΔRCA>0	No RCA (RCA<1) Decreasing ΔRCA<0	RCA (RCA>1) Increasing ΔRCA>0	RCA (RCA>1) Decreasing ΔRCA<0	% RCA reinforced (2)+(4)-(3)-(5)/ (2)+(3)+(4)+(5)	% RCA reinforced (RCA>1) (4)-(5)/(4)+(5)	Total exported products
	(2)	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Niger	1,157	511	86	232	25.18	-45.91	3,502
Nigeria	1,458	1,753	23	91	-10.92	-59.65	4,366
Rwanda	321	204	64	145	4.90	-38.76	2,149
São Tomé and Príncipe	175	53	90	147	13.98	-24.05	1,427
Senegal	1,658	804	183	353	22.82	-31.72	4,027
Seychelles	483	432	31	176	-8.38	-70.05	2,449
Sierra Leone	618	419	128	358	-2.04	-47.33	2,825
Somalia	192	125	53	121	-0.20	-39.08	1,586
Southern African Customs Union (SACU)	2,030	1,942	295	641	-5.26	-36.97	5,015
Sudan	327	781	11	184	-48.12	-88.72	2,658
Togo	930	762	141	380	-3.21	-45.87	3,450
Uganda	1,485	615	162	278	29.69	-26.36	3,913
Tanzania	1,771	926	207	451	17.91	-37.08	4,346
Zambia	1,062	1,219	91	419	-17.38	-64.31	4,026
Zimbabwe	1,379	1,378	170	474	-8.91	-47.20	4,513

Note: number product lines (HS-6 digits).

Table A.3 Structural change in sub-Saharan Africa

Country	Year	Labour productivity growth %	Within method 1 %	Structural change method 1 %	Labour productivity growth %	Within method 2 %	Structural change method 2 %
Angola	2010	3.21	2.94	0.27	3.21	3.21	0.00
Benin	2005	2.26	2.24	0.01	2.26	2.30	-0.04
Botswana	2010	2.33	2.01	0.31	2.33	4.59	-2.27
Burkina Faso	2004	2.25	2.36	-0.11	2.25	0.24	2.01
Burundi	2010	0.24	2.70	-2.46	0.24	-17.80	18.03
Cameroon	2007	-0.62	-1.44	0.82	-0.62	-2.03	1.41
Cape Verde	2010	4.89	4.84	0.05			
Central African Republic	2006	-1.15	-1.04	-0.10			
Chad	2004	2.09	1.41	0.68	2.09	0.27	1.83
Democratic Republic of Congo	2010	-3.76	-4.03	0.27	-3.76	-0.09	0.83
Congo	2010	0.74	-0.18	0.92			
Cote d'Ivoire	2010	-0.25	-0.38	0.13			
Equatorial Guinea	2008	16.40	15.70	0.70			
Eritrea	2009	0.98	1.08	-0.10			
Ethiopia	2010	3.81	3.94	-0.12	3.81	1.78	2.03
Gabon	2010	0.82	-7.07	7.89	0.82	-0.47	1.29
Gambia	2010	1.61	1.62	0.00	1.61	1.62	0.00
Guinea	2010	0.43	-0.43	0.86	0.43	-0.26	0.69
Kenya	2010	2.00	6.03	-2.46	2.00	3.72	-1.73
Lesotho	2010	3.57	3.18	0.35	3.57	-13.81	17.38
Liberia	2010	3.53	-0.56	0.06	3.53	3.34	0.19
Madagascar	2009	-0.50	-0.26	0.85	-0.50	4.54	-5.04
Malawi	2010	0.58	1.12	0.31			
Mali	2007	1.43	1.33	-1.31	1.43	32.64	-31.20
Mauritania	2010	0.02	4.94	0.31			
Mauritius	2010	5.25	6.38	-1.74	5.25	4.99	0.26
Mozambique	2010	4.64	7.65	-1.61	4.64	9.27	-4.63

(continued)

Table A.3 Structural change in sub-Saharan Africa (continued)

Country	Year	Labour productivity growth %	Within method 1 %	Structural change method 1 %	Labour productivity growth %	Within method 2 %	Structural change method 2 %
Namibia	2010	6.04	-2.03	0.30	6.04	3.91	2.13
Niger	2003	-1.73	5.86	-0.55			
Rwanda	2010	5.31	1.17	-0.01	5.31	7.66	-2.34
Senegal	2010	1.16	1.26	0.71	1.16	0.04	1.12
South Africa	2010	1.98	4.89	-0.37	1.98	0.57	1.41
Sudan	2010	4.53	0.95	0.64			
Swaziland	2010	1.59	1.96	0.32			
Tanzania	2010	2.27	-0.43	0.13	2.27	0.47	1.80
Togo	2010	-0.30	3.83	0.22	-0.30	-0.73	0.43
Uganda	2010	4.04	-0.38	0.81	4.04	8.98	-4.93
Zambia	2010	0.42	1.78	0.45	0.42	1.75	-1.33
Sub-Saharan Africa weighted av.		2.31			2.11	1.87	0.33

Note: see decomposition in equation (1). Within component correponds to $\sum_{i=n} s_{it}\Delta VL_{it}$; while structural component corresponds to between-sector growth $\sum_{i=n} \Delta s_{it} VL_{it}$.

Figure A.1 Sector decomposition of AfT flows by recipient

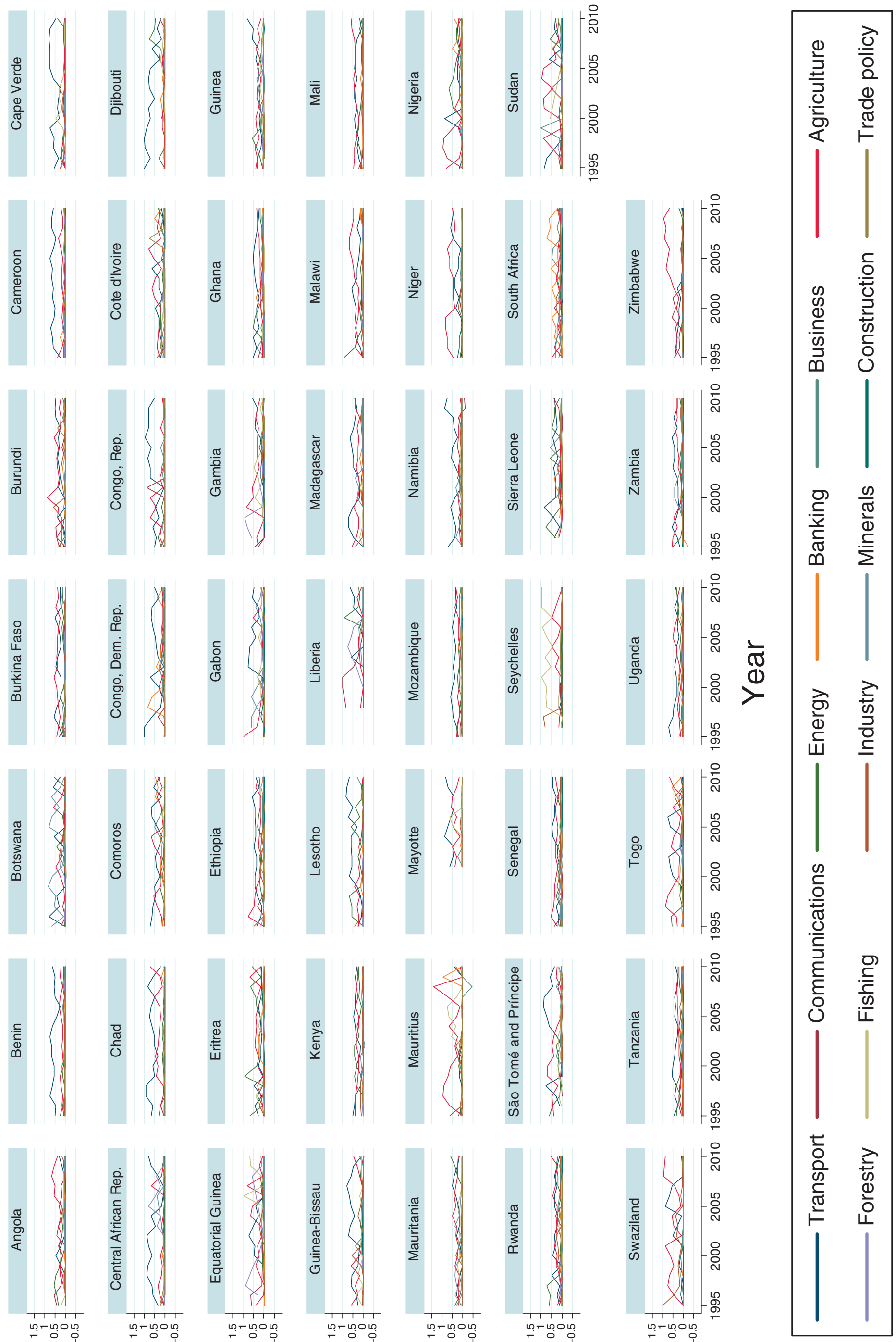
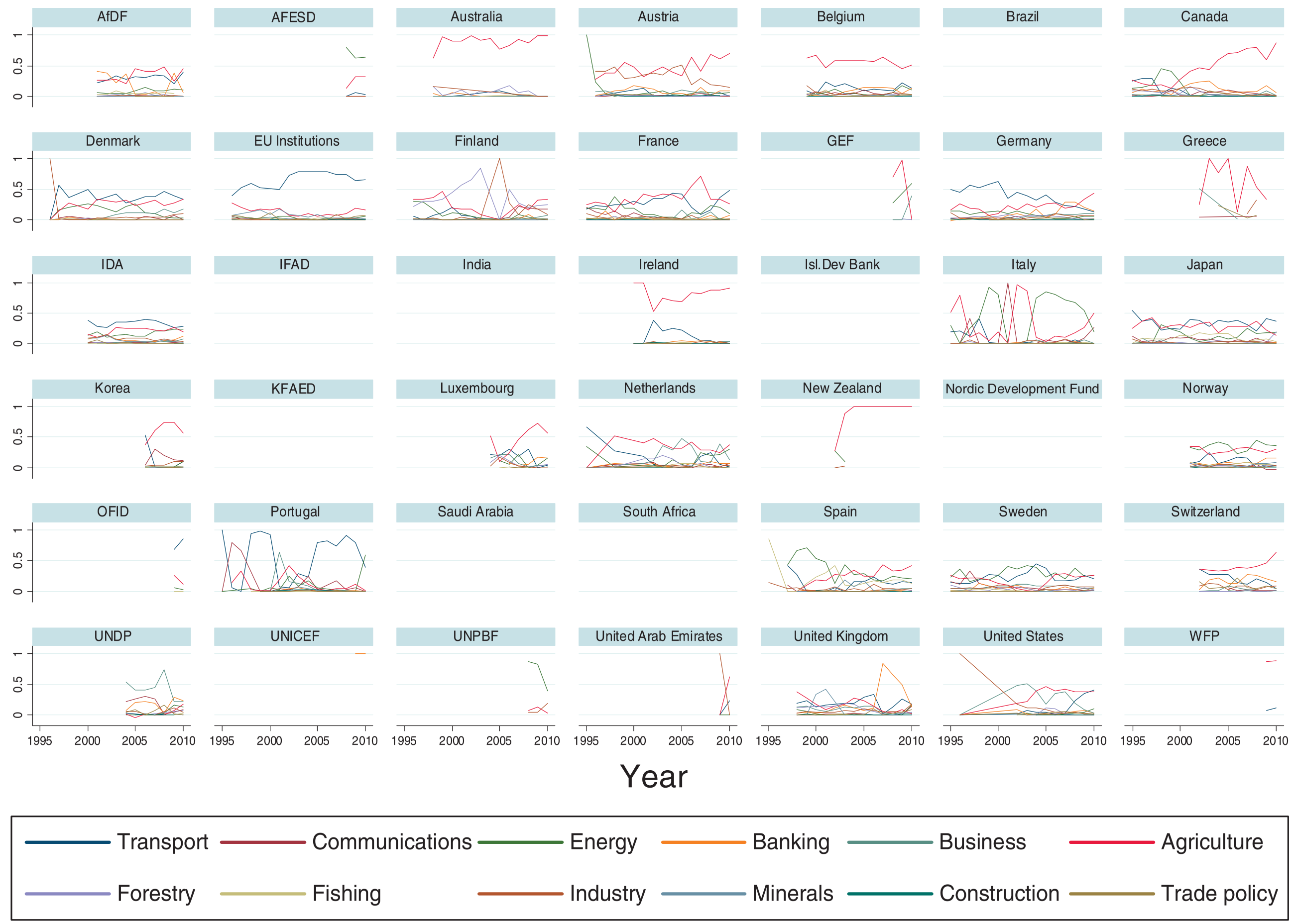


Figure A.2 Sector decomposition of AfT flows by recipient and donor



Notes: AfDF African Development Fund, AFESD Arab Fund for Economic and Social Development, GEF Global Environment Facility, IDA International Development Association, IFAD International Fund for Agricultural Development, KFAED Kuwait Fund for Arab Economic Development, OFID OPEC Fund for International Development, UNDP United Nations Development Programme, UNICEF United Nations Children's Fund, UNPBF United Nations Peacebuilding Fund, WFP World Food Programme

References

Abizadeh, S and M Pandey (2009), 'Trade Openness, Structural Change and Total Factor Productivity', *International Economic Journal*, Vol. 23 No. 4, 545–559.

Anderson, JE and E van Wincoop (2003), 'Gravity with Gravitas: A Solution to the Border Puzzle', *The American Economic Review*, Vol. 93 No. 1, 170–192.

Anderson, JE and YV Yotov (2012), 'Gold Standard Gravity', *NBER Working Paper* 17835, National Bureau of Economic Research, Cambridge.

Andreoni, A (2010), 'A Capability Theory of Production: learning in time, complementarities and proximities', paper presented at the DIME Conference, S Anna Laboratory of Economic Management, Pisa, November.

Baier, S and J Bergstrand (2009), 'Bonus vetus OLS: A simple method for approximating international trade-cost effects using the gravity equation', *Journal of International Economics*, Vol. 77 No. 1, 77–85.

Bhorat, H (2000), 'The impact of trade and structural changes on sectoral employment in South Africa,' *Development Southern Africa*, Vol. 17 No. 3, 437–466.

Brenton, P and E von Uexkull (2009), 'Product specific technical assistance for exports – has it been effective?', *The Journal of International Trade and Economic Development*, Vol. 18 No. 2, 235–254.

Cali, M and DW te Velde (2008), 'Towards a Quantitative Assessment of Aid for Trade,' *ODI Economic Paper Series*, Overseas Development Institute, London.

Easterly, W and A Reshef (2010), 'African Export Successes: Surprises, Stylized Facts, and Explanations,' *NBER Working Papers* 16597, National Bureau of Economic Research, Cambridge.

Groshen, EL and S Potter (2003), 'Has Structural Change Contributed to a Jobless Recovery?,' *Current Issues in Economics and Finance*, Vol. 9, August.

Havlik, P (2005), 'Central and East European Industry in an Enlarged European Union: Restructuring, Specialisation and Catching-up', *Economie Internationale*, CEPII Research Center, Issue 102, 107–132.

Helble, M, C Mann and J Wilson (2009), 'Aid for Trade Facilitation', *Policy Research Working Paper* 5064, World Bank, Washington, DC.

Hsieh, C-T and P Klenow (2009), 'Misallocation and Manufacturing TFP in China and India', *Quarterly Journal of Economics*, Vol. 124, 1403–1448.

Jiang, Y (2012), 'Openness, the Spatial Spillover Effect Of Productivity, and Regional Growth of Inland Provinces in China', *Review of Urban and Regional Development Studies*, Vol. 24, 1–16.

Lewis, WA (1954), 'Economic Development with Unlimited Supplies of Labor,' *Manchester School of Economic and Social Studies*, Vol. 22, 139–91

Lloyd, T, M McGillivray, O Morrissey and R Osei (2000), 'Does Aid Create Trade? An Investigation for European Donors and African Recipients', *European Journal of Development Research*, Vol. 12 No. 1, 107–123.

Maroto-Sánchez, A and JR Cuadrado-Roura (2009), 'Is growth of services an obstacle to productivity growth? A comparative analysis', *Structural Change and Economic Dynamics*, Vol. 20 No. 4, 254–265.

Martínez-Zarzoso, I, F Nowak-Lehmann, S Klasen and M Larch (2009), 'Does German development aid promote German exports?', *German Economic Review*, Vol. 10 No. 3, 317–338.

McMillan, M and D Rodrik (2011), 'Globalization, Structural Change and Productivity Growth' in M Bacchetta and M Jansen (Eds.), *Making Globalization Socially Sustainable*, World Trade Organization and ILO, Geneva.

Memedovic, O and L Lapadre (2010), Structural change in the world economy: Main features and trends, *Research and Statistics Branch Working Paper*, 24/2009, United Nations Industrial Development Organization, Vienna.

Montobbio, F and F Rampa (2005), 'The impact of technology and structural change on export performance in nine developing countries', *World Development*, Vol. 33 No. 4, 527–547.

Novy, D (2012), 'Gravity Redux: Measuring International Trade Costs with Panel Data,' *CEP Discussion Papers* 1114, Centre for Economic Performance, LSE.

Nowak-Lehmann, F, I Martínez-Zarzoso, D Herzer, S Klasen and A Cardozo (2013), 'Does foreign aid promote recipient exports to donor countries?', *Review of World Economics*, Vol. 149 Issue 3, 505–535.

OECD (2011), *Aid for Trade at a Glance 2011: Showing Results*, OECD, Paris.

Page, J (2012), 'Aid, Structural Change and the Private Sector in Africa', *UNU-WIDER Research Paper* WP2012/21.

Rajan, RG and A Subramanian (2011), 'Aid, Dutch disease, and manufacturing growth', *Journal of Development Economics*, Vol. 94 No. 1, 106–118.

Rodrik, D (2011), 'Unconditional Convergence,' *CEPR Discussion Papers* 8631, CEPR, London.

Silva, SJ and D Nelson (2012), 'Does aid cause trade? Evidence from an asymmetric gravity model', *World Economy*, Vol. 35 No. 5, 545–577.

Szirmai, A (2012), 'Industrialisation as an engine of growth in developing countries, 1950–2005', *Structural Change and Economic Dynamics*, Vol. 23 No. 4, 406–420.

Teignier, M (2012), 'The Role of Trade in Structural Transformation', *mimeo*.

USAID (2010), 'From Aid To Trade: Delivering Results: A Cross-Country Evaluation of USAID Trade Capacity Building', US Agency for International Development, Washington, DC.

Wagner, D (2003), 'Aid and trade: An empirical study', *Journal of the Japanese and International Economies,* Vol. 17 No. 2, 153–173.