Bilateral Foreign Direct Investment from South Africa and Income Convergence in the SADC Region

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July 2015

Outline

- Introduction and Motivation
- Research Objectives
- Literature Overview
- Research Methods
- Results Presentation and Discussion
- Conclusion

INTRODUCTION AND MOTIVATION

- Intra-Africa foreign direct investment has been increasing, led by South African, Mauritian, Kenyan and Nigerian transnational corporations (TNCs);
- Share of intra-Africa greenfield investment projects rose to 18% of the cumulative FDI for Africa between 2009&2013 compared to 5% over the period 2003 to 2010 (UNCTAD, 2014);
- Intra-African investments also increasingly concentrated in manufacturing as opposed to extractive sectors;
- This potentially gives the continent enhanced growth opportunities in intra-regional trade, value chains and technology convergence;
- Regionally, SADC has had significant increases in both intra-regional FDI and FDI from the rest of the world;

INTRODUCTION AND MOTIVATION

- The region hosts a regional leader; South Africa playing dominant roles with respect to trade, FDI and technology endowments;
- e.g S.Africa constitutes at least 25% of the SADC intra-regional trade and up to 80% of the individual countries' foreign direct investment stocks;
- Given these facts, the empirical questions asked and addressed in this study are:
  - whether the high intra-regional FDI has led to significant technology diffusion and income convergence in the region; or

- Given that the issue of income and growth convergence across countries is contentious (e.g the endogenous vs exogenous growth theorists), these questions remain an empirical issue.

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  - whether the high intra-regional FDI has led to significant technology diffusion and income convergence in the region; or
  - whether there can be such prospects of income convergence over time.
- Given that the issue of income and growth convergence across countries is contentious (e.g the endogenous vs exogenous growth theorists), these questions remain an empirical issue.

INTRODUCTION AND MOTIVATION

- There are a number of other motivating factors in support of convergence possibility in SADC;
  - Technology spillover and catch-up hypothesis *(Barro and Sala-i-Martin, 2004 and Keller, 2004)*;

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  - High factor mobility in the region (factor price equalization hypothesis, *Samuelson, 1948)*;
  - The role of geographical proximity in technology and productivity spillovers *(Keller, 2002; Keller, 2004 and Comin, et al, 2003)*.
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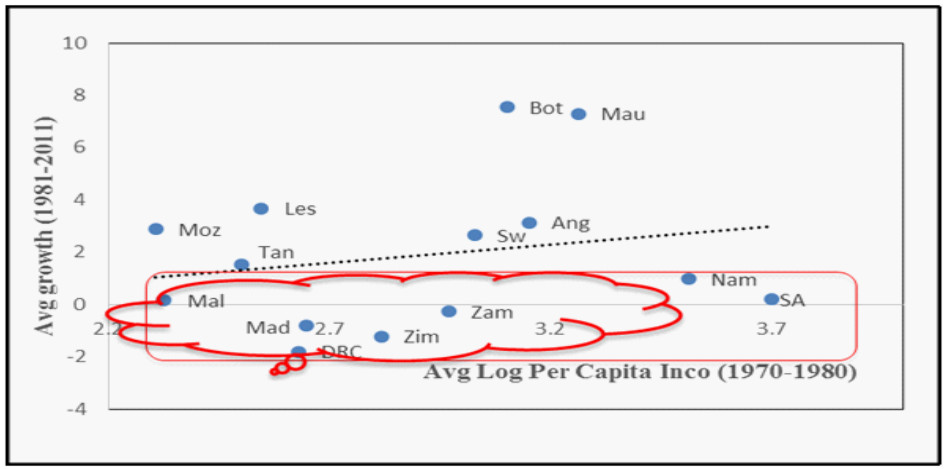
INTRODUCTION AND MOTIVATION

- With facts on per capita income in the region seemingly suggesting divergence;

Income per Capita Convergence in SADC



Data Source: WDI (2014)

- The picture is puzzling given convergence in other regional integrations, e.g the EU, OECD countries and Asia (*Ben-David, 1993; Barro and Sala-i-Martin, 1991; Kasahara, 2004)*;

DATA

- To answer the study's research questions, we employ per capita income time series data over 1980 to 2011 period from WDI; PWT8.0; SADC, and UNCTAD;
- Countries are classified into high and low bilateral FDI countries on the basis of the UNCTAD 2001-2012 bilateral FDI figures
- FDI is of interest as the hypothesized source of international technology diffusion following *(Keller and Yeaple, 2009 & Yasar and Paul, 2008)*
- The SADC case is chosen due to the convergence motivating factors on the region;

THEORETICAL LITERATURE

The Exogenous Growth Framework-Convergence *(Solow, 1956 and Swan, 1956)*

$$Y_{it} = A(t).F(L_{it}K_{it}) \tag{1}$$

Assuming perfect competition, access to similar technology and DMP of capital (converging capital and output per worker)
The Endogenous Growth Framework - with localized productivity externalities and hence no obvious convergence;*(Romer, 1986, Lucas, 1988 and Grossman and Helpman, 1991)*

$$Y_{ijt} = A(L_{it}, K_{it}).F(L_{ijt}K_{ijt}) \tag{2}$$

A **Leader Follower model** of International Tehnology Diffision and Catch-up is sugested by *Barro and Sala-i-Martin (1997 and 2004)*, suggesting convergence through a process of innovation by the technology leader and imitation by the followers;

EMPIRICAL LITERATURE REVIEW

- Empirical work on income convergence on states or region of a country or countries that are harmonized by some common factors have largely confirm absolute convergence *(Ben-David, 1993; Barro and Sala-i-Martin, 1991; Baumol, 1986 and Abramovitz, 1986)*;
- Studies by the endogenous growth theorists or on heterogenous countries have largely refuted convergence or at best find club convergence *(Romer, 1994; Lucas, 1988; Mankiw et al, 1992; Jones, 2002; Jones and Bernard, 1986 and Quah, 1996)*;
- Studies that explicitly link convergence to the international diffusion of technology have mostly confirmed convergence *(Oz, 2014; Ben-David, 1996; Choi, 2004; Neto and Veiga, 2013 and Bijsterbosch and Kolasa, 2009)*;

THEORETICAL FRAMEWORK

- The study adopts and uses the *Barro and Sala-i-Martin (1997 & 2004)* leader follower theoretical convergence framework;
- The general model framework predicts that growth of income per capita in the technology poor and follower country is linked to growth in the technology leader country, ie

$$\frac{\widehat{y_{it}}}{y_{it}} = \gamma_{SA,t} + H\left[\frac{y_{it}}{y_{SA,t}}, \left(\frac{y_{it}}{y_{SA,t}}\right)^*\right] \tag{3}$$

- Where $\frac{\widehat{y_{it}}}{y_{it}}$=per capita income growth in follower country;$\gamma_{SA,t}$= growth of income in the leader (S.A); $\frac{y_{it}}{y_{SA,t}}$= ratio of income for the follower to the leader and $\left(\frac{y_{it}}{y_{SA,t}}\right)^*$ = ratio of steady state incomes between the leader and follower countries;
- H is such that $H_i > 0$, $H_{sa} < 0$ and $H(\bullet, \bullet) = 0$ at $\frac{y_{it}}{y_{SA,t}} = \left(\frac{y_{it}}{y_{SA,t}}\right)^*$;

THE ESTIMATION FRAMEWORK

- To enable the analysis of the impact of differences in bilateral FDI between countries and S.Africa, countries in the region are classified into Low and High Bilateral FDI categories at the average regional bilateral FDI cut-off point;
- We specify empirical model 5 as the convergence estimation model applied to the whole region and the two country sub-categories:

$$\log\left(\frac{y_{it}}{y_{it-1}}\right) = \log\left(\frac{y_{SA,t}}{y_{SA,t-1}}\right) - \theta\left[\log\left(\frac{y_{i,t}}{y_{SA,t}}\right) - \log\left(\frac{y_{i,t}}{y_{SA,t}}\right)^{*}\right] \quad (4)$$

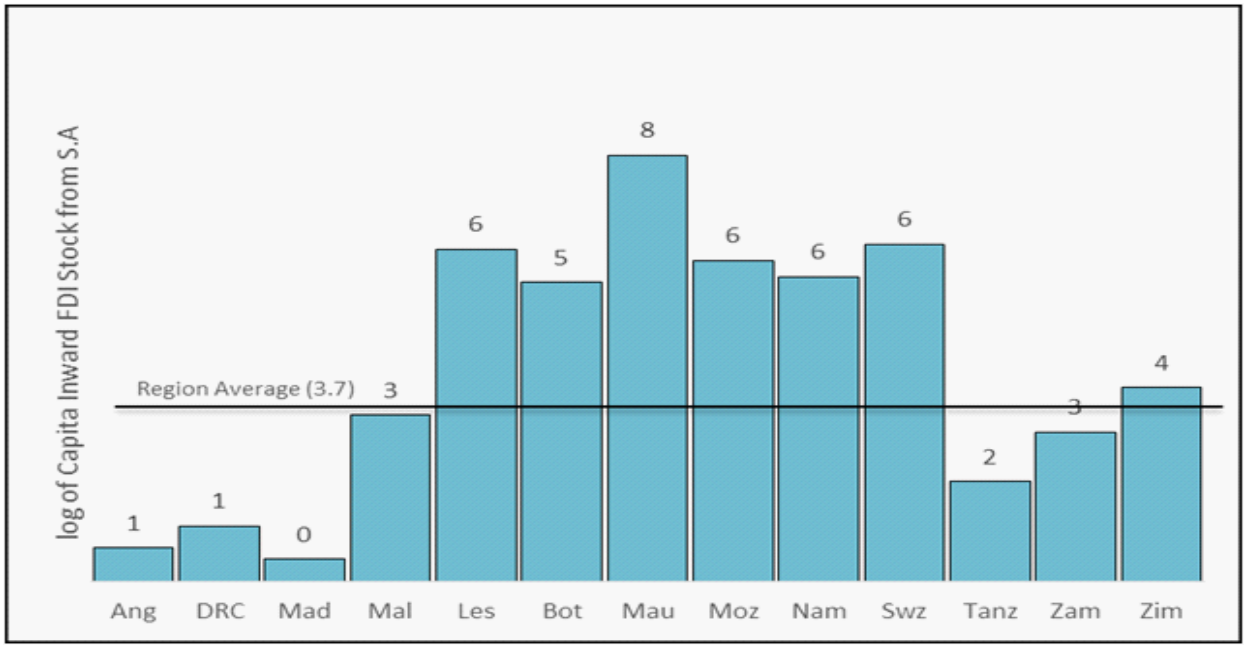
simplified to:

$$\log\left(\frac{y_{it}}{y_{SA,t}}\right) = a + b\log\left(\frac{y_{i,t-1}}{y_{SA,t-1}}\right) + \varepsilon_{it} \quad (5)$$

Where $a = \log\left(\frac{y_{i,t}}{y_{SA,t}}\right)^{*}$ and $\theta = \frac{1}{b} - 1$; Interest is in the $\theta-$convergence Rate- the average catch up rate of the relatively poorer economies to South Africa; The popular β-convergence does not link convergence to the FDI and technology source country's per capita income;

THE ESTIMATION FRAMEWORK....

- High Bilateral FDI Countries: Lesotho; Botswana; Mauritius; Mozambique; Namibia and Swaziland



- Zimbabwe is classified into the low FDI group due to the high industrial excess capacity of about 70% (CZI, 2014) for the country during the sample perid

BILATERAL CONVERGENCE ON SOUTH AFRICA

- The unit root time series approach is used to determine country pairwise convergence on South Africa;
- Individual countries converge on South Africa as the source of FDI when there is no unit roots and trend in their pairwise income difference *(Bernard and Durlauf, 1995)*

$$\lim_{k \to \infty} E(y_{i,t} - y_{SA,t+k} | I) = 0 \tag{6}$$

- Following Ben-David (1996), the definition is operationalized using the ADF model

$$X_{i,t} = \varphi X_{i,t-1} + \sum_{m=1}^{m} c_j \Delta X_{i,t-m} + \varepsilon_{i,t} \tag{7}$$

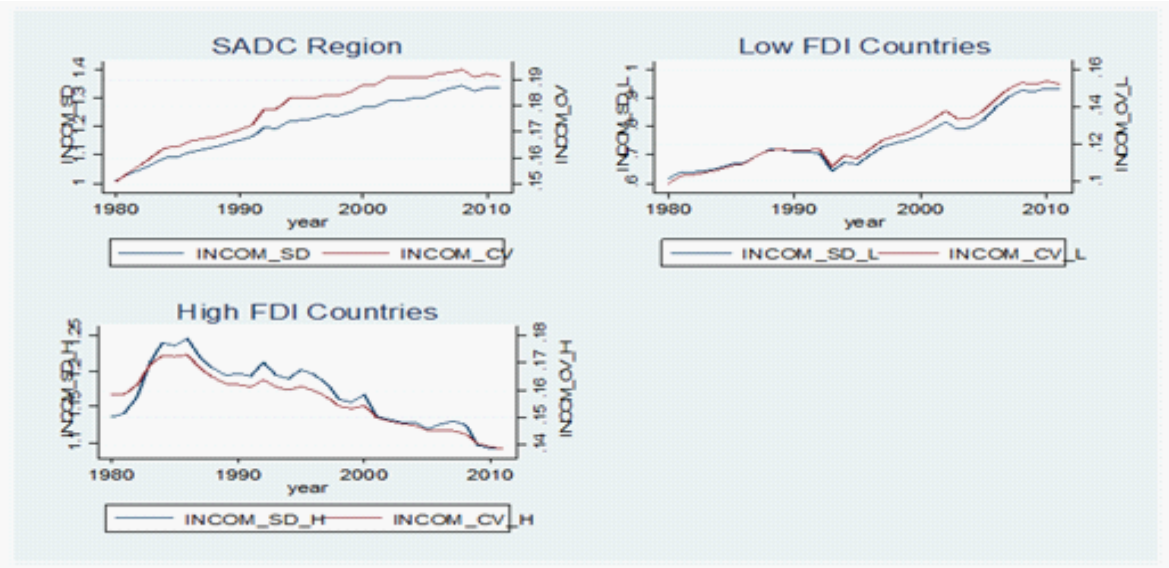
With $X_{i,t} = y_{i,t} - y_{SA,t}$ and $\Delta X = X_{i,t} - X_{i,t-1}$

- Equation 11 is estimated with the trend and intercept *(Durlauf, 1995)*
- m is determined on a general-to-specifiv procedure beginning at 4;
- Trend stationarity implies synchronized long term incomes *(Bernard*

DESCRIPTIVE RESULTS ANALYSIS

- There is income divergence for the region as a whole and for the low FDI country category;
- High bilateral FDI countries exihibit convergence since the mid 1980s;

Income per Capita Dispersion in SADC



Income standard deviations and coefficient of variation (normalized SD)

INCOME DYNAMICS IN SADC (1970-2011)

Dynamics of Income Per Capita in SADC (US Dollar)

	1970-1979	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004	2005-2011	% Change
Region Average	1233	1320	1395	1491	1586	1729	2089	69.4
Region Median	717	706	675	659	632	661	739	3.0
High FDI Avg	1389	1537	1633	1802	1948	2135	2538	82.8
Low FDI Avg	1233	1320	1395	1491	1536	1590	1754	42.3
High:Low Ratio	1.1	1.2	1.2	1.2	1.3	1.3	1.4	28.5

//Monetary figures are in USD terms (Base=2005) Avg=average
//The 1970-1979 period is immaterial. It has only been included to show countries' starting points

- Median income persistently lower than average income
- Charactristic of few countries driving the average;
- A breakdown of the incomes between the high and low FDI countries shows high FDI growing fater than low FDI,

INCOME DYNAMICS IN SADC (1970-2011)....

Ratio of South Africa's Per Capita Income to Individual Countries' Incomes

	1970-1979	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004	2005-2011	% Change
Angola	3.5	3.9	3.2	3.7	3.9	3.4	2.3	-34.3
Botswana	4.1	2.5	1.7	1.2	1.1	1.0	0.9	-77.4
DRC	11.5	15.0	14.3	20.1	30.1	39.1	38.6	235.9
Lesotho	14.5	12.4	10.8	8.5	7.6	7.2	6.9	-52.4
Madagascar	11.2	14.7	15.1	15.5	16.6	17.7	19.9	78.2
Malawi	23.7	24.3	24.7	24.1	21.0	23.0	24.9	4.8
Mauritius	2.7	2.7	1.9	1.4	1.2	1.0	1.0	-64.2
Mozambique	24.7	29.0	30.4	24.9	21.7	17.6	15.7	-36.3
Namibia	1.5	1.7	1.7	1.6	1.6	1.5	1.4	-7.9
Swaziland	4.7	4.1	3.3	2.3	2.1	2.2	2.3	-50.6
Tanzania	15.8	17.4	17.3	15.9	16.0	14.4	13.2	-16.3
Zambia	5.3	6.7	7.0	7.2	8.1	8.2	8.0	52.0
Zimbabwe	7.5	8.1	7.8	7.1	6.6	8.5	14.2	88.8

//Figures reflect ratios of period simple averages of per capita incomes
//The 1970-1979 period is immaterial. It has only been included to show countries' starting points

- In 1980, South Africa up to 30 times richer than the poorest country & by 2011 up to 39 times richer than the poorest country;
- Suggest income position shifts and wide dispersion

CONVERGENCE ON AVERAGE INCOMES

Convergence to the Panel Average Income

	SADC		*High FDI Countries*		*Low FDI Countries*	
VARIABLES	RE	FE	RE	FE	RE	FE
Log of Income Gap	0.995***	0.962***	0.985***	0.953***	0.998***	0.981***
	(0.004)	(0.007)	(0.004)	(0.009)	(0.008)	(0.011)
Constant	0.000	0.000	0.026***	0.055***	-0.015*	-0.03***
	(0.005)	(0.001)	(0.006)	(0.005)	(0.009)	(0.008)
Observations	364	364	156	156	182	182
No. of Countries	14	14	6	6	7	7
R-squared	0.96	0.96	0.91	0.91	0.94	0.94
P>F-Stat	0.00	0.00	0.00	0.00	0.00	0.00
Convergence Rate (%)	0.5	3.8	1.5	4.7	0.2	1.9
Half Life Years	140	18	46	10	340	36

- Countries diverge given the current country conditions (assuming the RE model);
- The high FDI countries converge at about 1.5% p.a with half-life to convergence of about 46 years;
- No convergence for the low FDI countries

CONVERGENCE ON SOUTH AFRICA

Average Income Convergence on South Africa

	SADC		*High FDI Countries*		*Low FDI Countries*	
VARIABLES	RE	FE	RE	FE	RE	FE
Log of Lag Income Gap	0.993***	0.952***	0.976***	0.948***	1.004***	0.992***
	(0.004)	(0.007)	(0.005)	(0.007)	(0.008)	(0.013)
Constant	-0.005	-0.076***	-0.003	-0.068***	0.004	-0.027
	(0.009)	(0.013)	(0.008)	(0.009)	(0.021)	(0.032)
Observations	364	364	156	156	182	182
No. of Countries	14	14	6	6	7	7
R-squared	0.98	0.98	0.99	0.99	0.97	0.97
P>F-Stat	0.00	0.00	0.00	0.00	0.00	0.00
Convergence Rate (%)	0.7	5.0	2.5	5.5	diverge	0.8
Half Life Years	99	14	29	13	diverge	87

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

- The dependent variable is the log of the ratio of countries' incomes to that of South Africa;
- The convergence rate for high FDI countries has improved from 1.5% in table 3 to 2.5% and half-life to convergence of 29 years;
- In both cases, the role of country specifics is large.

CONDITIONAL CONVERGENCE ON SOUTH AFRICA

IV Estimation Results for Income Gap

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lag Income Gap	0.82***	0.85***	0.85***	0.81***	0.95***	0.95***	0.85***
	(0.03)	(0.04)	(0.03)	(0.04)	(0.01)	(0.01)	(0.04)
In. FDI from S.Africa	0.01*						
	(0.00)						
Out. FDI to S.Africa		0.01					
		(0.01)					
Total Bilateral FDI			0.01**				0.02**
			(0.01)				(0.01)
Total FDI from ROW				-0.01			
				(0.00)			
Trade Growth					0.05***		0.09***
					(0.02)		(0.03)
Gross Dom. Investment						0.19***	-0.02
						(0.07)	(0.19)
Constant	-0.3***	-0.3***	-0.3***	-0.3***	-0.1***	-0.1***	-0.3***
	(0.06)	(0.07)	(0.06)	(0.06)	(0.02)	(0.02)	(0.06)
Observations	119	121	132	119	390	367	127
No. of Countries	12	11	12	12	13	13	12
R-squared	0.86	0.86	0.86	0.86	0.96	0.96	087
P>F-Stat	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hansen J (P-Value)	0.42	0.76	0.19	0.73	0.70	0.87	0.24
Kleibergen-Paap (?)	93	13	14	69	102	56	17
Exogeneity (P-Value)	0.05	0.03	0.13	0.10	0.00	0.01	0.02

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

- Total per capita FDI stock has a positive and significant impact on convergence; Bilateral FDI dominates, trade, investment, and FDI

PAIRWISE COUNTRY CONVERGENCE TO S. AFRICA

Country Pairwise Income Convergence to South Africa

Country	Intercept (P-Value)	Trend (P-Value)	ADF (P-Value)	Stationarity *	Convergence **
		----HIGH FDI COUNTRIES---			
Botswana	0.722	0.985	0.031	S	YES
Lesotho	0.231	0.452	0.002	S	YES
Mauritius	0.903	0.902	0.001	S	YES
Mozambique	0.000	0.000	0.000	TS	NO
Namibia	0.005	0.004	0.005	TS	NO
Swaziland	0.701	0.212	0.128	NS	NO
		----LOW FDI COUNTRIES---			
Angola	0.119	0.290	0.237	NS	NO
DRC	0.052	0.117	0.065	TS	NO
Madagascar	0.039	0.022	0.038	TS	NO
Malawi	0.120	0.452	0.111	NS	NO
Tanzania	0.024	0.11	0.024	TS	NO
Zambia	0.185	0.605	0.208	NS	NO
Zimbabwe	0.249	0.109	0.184	NS	NO

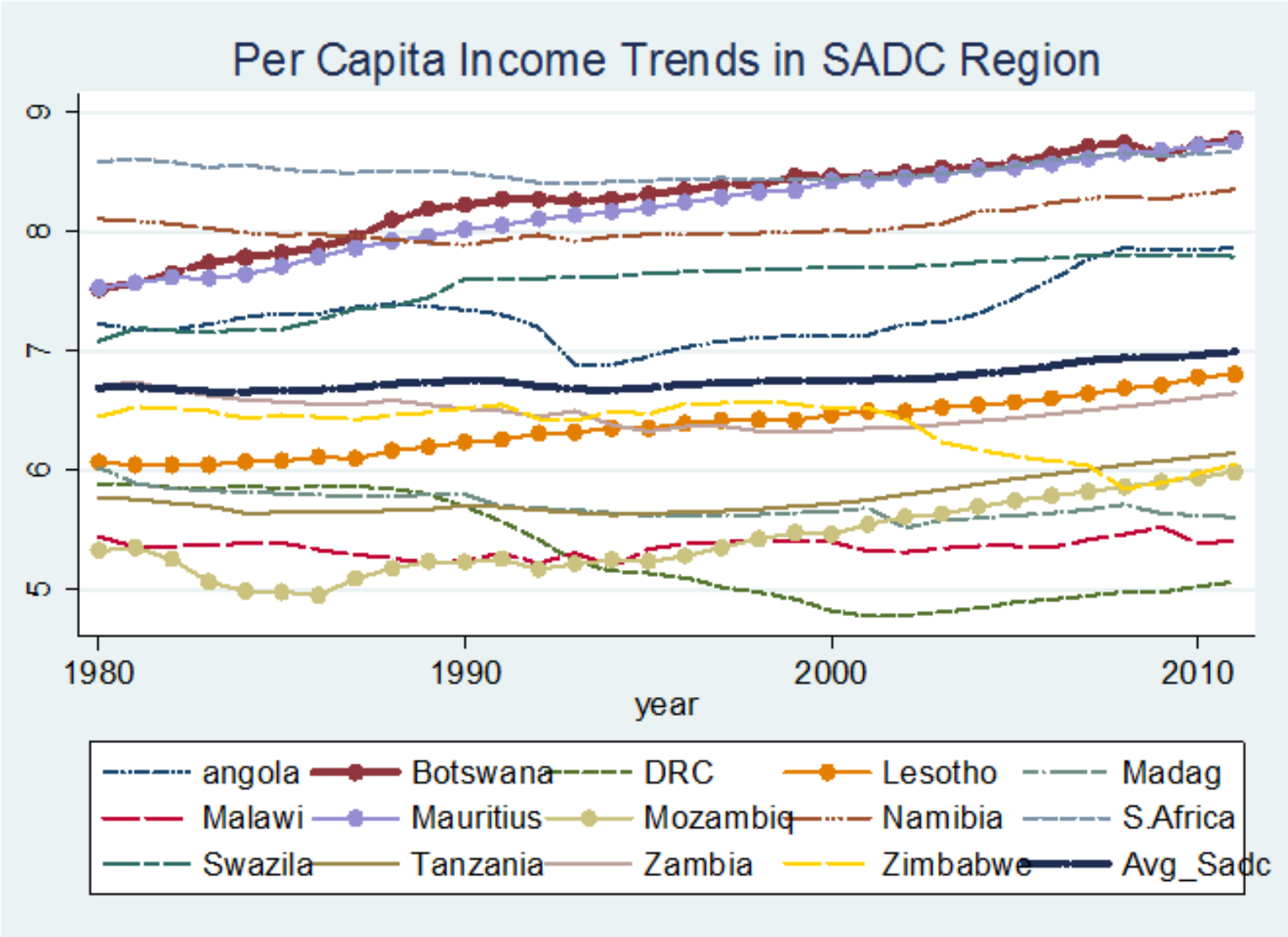
*S=Stationary; *NS=Not Stationary; TS=Trend Stationary;
**YES=Convergence; **NO=No Convergence

- all the countries in the high FDI category either have incomes which convergence to South Africa or have some trend convergence
- There is no evidence of any country converging on South Africa among the low FDI countries;
- Three out of seven countries with incomes determined by the same

CONCLUSION

- The study sought to investigate whether bilateral foreign direct investment between South Africa and countries in SADC improves countries 'catch-up to South Africa;
- There is no absolute income convergence in the region when the role of bilateral FDI from South Africa is not taken into account;
- The study finds that countries hosting more bilateral FDI from South Africa converge faster on the region average income and South Africa's per capita income;
- There are significant differences in the convergence rates between the fixed effects and the random effects models;
- When FDI is controlled for among other technology transmitters, FDI dominates;
- We note the weakness in the short time span for which there is bilateral FDI statistics;
- Future studies should extend the estimation period over longer periods on data availability;
- In overall terms, FDI from South Africa is important for the region;

ThankYou


Per Capita Income Trends in SADC Region
9
8
7
6
5
1980
1990
2000
2010
year
angola
Botswana
DRC
Lesotho
Madag
Malawi
Mauritius
Mozambiq
Namibia
S.Africa
Swazila
Tanzania
Zambia
Zimbabwe
Avg_Sadc