Income Development and Sigma convergence in South–South Agreement Areas

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Abstract
Some of the new trade and economic geography theory findings are quite critical concerning the so called South-South-agreements. This study contributes to this discussion by means of an empirical analysis of a representative set of South-South integration areas. Sperlich and Sperlich (2011) have proven that these promote growth and beta-convergence. Here we analyse the income developments of its member states and check for income (sigma) convergence in each area. The results show that income dispersion does not generally decrease although we find some indications of sigma convergence. Furthermore, even when we correct for possible business cycle effects in a rather generous way, the sigma path is hardly ever monotone. These findings will be placed in relation to growth models and beta convergence. All results are compared to existing studies on the particular integration areas.

Keywords: South-South agreements, sigma convergence, regional integration, development economics, income dispersion.

JEL code: F15, F43, O43, O11, E13

1 Corresponding author: yvonne.sperlich@bluewin.ch. The authors appreciated a lot helpful discussions with Marcelo Olarreaga (Université de Genève), Ricardo Mora (Univ. Carlos III de Madrid), Walter Zucchini (Universität Göttingen, Research center for poverty, equity and growth), Inmaculada Martinez-Zarzoso (Universitat Jaume I), the participants of the WTO, UNCTAD, CTEI and UNIGE workshops as well as the participants of the colloquium of the Center for European, Governance and Economic Development Research, Göttingen.
1. Literature review on pros and cons of South-South agreement areas

Until today, it is disputed to what extent South-South agreements is boon or bane for growth and development. Main criticisms are that they would lead to increasing income disparity and trade diversion at the expense of the poorest regions. This paper adds some empirical facts about the income development in these regional integration areas (RIAs henceforth). We consider the per capita income paths and its dispersion within the South-South areas and relate them to growth models and measures of inequality. To this aim we have analysed a representative sample of RIAs in the three world regions South Asia, South America, and West and Central Africa over the last four decades.

Often used measures to analyse income inequality are the sigma dispersion, the Theil populations-weighted index, and the Gini index, see Duro (2004) or Rey and Janikas (2005) for details. The Gini index is inadequate for country sets and small samples, and the Theil index is mainly interesting for decomposing the cross-national disparity of inequality within and between groups. We are mainly interested in the convergence or divergence dynamics between countries inside the South-South RIAs. In contrast to the $\beta$-convergence approach, there is no econometric model behind $\sigma$-convergence; one simply measures the log of per capita income (l.c.p. income henceforth) dispersion across countries at different time points. Barro and Sala-i-Martin (1992) highlighted why it is interesting and important to consider both the $\beta$- and the $\sigma$-convergence of income development. Clearly they are conceptually different; while $\sigma$-convergence shows the disparity of income over time among members, $\beta$-convergence represents the long-term mobility of income (Sala-i-Martin, 1996, Quah, 1996b). Nevertheless, if one consults a growth model, further conclusions can be drawn. In a related paper based on the Solow growth model, Sperlich and Sperlich (2011) found conditional and unconditional $\beta$-convergence, and enhanced growth inside most of the here considered RIAs, namely MERCOSUR, ASEAN, WAEMU, CEMAC, ECOWAS, and the whole CFA-zone. A different but politically not less important question is the one of income convergence and inequality in South-South agreement areas (cf. Ben-David, 1993).

There exists a general criticism against regional integration agreements saying that they would lead to trade creation but also to trade diversion and it is not clear a priori whether the trade creation exceeds the diversion. Further, most of the South-South-integration areas involve several parallel and overlapping agreements which typically favor the economically stronger members impeding real (trade) liberalization rather than promot-
ing it; see e.g. Bhagwati, Greenaway, and Panagariya (1998). South-South agreements are especially subject to the poor stays poor criticism, coinciding with the hypothesis of club convergence. This club convergence hypothesis competes with the absolute or conditional convergence hypothesis; see Galor (1996). A main factor causing convergence in RIAs is the knowledge and technology transfer, a stress of competition, and efficient compensation mechanisms. But along Quah (1996a), integration areas need the participation of strong economic leaders and openness to avoid the poverty trap. Arguments supporting the hypothesis of increasing inequality in South-South agreement areas are, for example, the non-complementary production and trade structures of the members, the agglomeration of manufacturing industries in relatively richer countries and the stronger trade diversion at the cost of the poorest members.

The new economic geography does not offer a uniform model theory for regional integration and convergence. Instead, it does try to work with more realistic hypotheses favoring endogenous growth models where, for example, technological progress is explained implicitly by the model. Most relevant factors for this school are transport costs, knowledge transfer, demand and realistic scale returns in the context of space-time modeling. For the short- and medium term, these models implicate divergence for RIAs after the foundation, because of negative effects though market liberalizations etc; see Krugman (1991) or Scott (2006). Krugman and Venables (1996) say that economic integration processes induce agglomeration especially if industrial development is unequally distributed at the initial stage. Therefore, liberalization together with regional integration leads to further concentration of economic activities. Baldwin, Martin, and Ottaviano (2001) pronounce strongly in favour of free trade to reach perfect international or regional transmission of learning externalities, they recommend “open regionalism”. Goodfriend and McDermott (1998) argue that the key factor of convergence processes is the openness to foreign ideas and technologies; a closed regionalism between developing countries must cause divergence due to of the lack of new technology and ability of innovation. According to Giannetti (2002), unequally distributed manufacturing industry locations lead to income divergence at country or regional-level because convergence depends on the possibility of knowledge spillover. She points out that member states do therefore not benefit uniformly from the exchange, and that agglomeration effects arise in short- and middle-terms. Venables (2003) looks at comparative price advantages; also his theory entails potential income divergence for RIAs of low-income
countries due to concentration processes of manufacturing industry towards countries with technological advantages. This advantage causes trade divergence as the poorer members will import from partners who would not be competitive on the global market. The poor members, however, have internationally competitive prices for unskilled labor. If comparative advantages are associated with the GDP p.c., e.g. via physical and human capital endowments, then RIAs can promote income convergence. But the unequal cost and benefits in South-South areas could lead to divergence. An instrument to reduce unequal integration costs is a functioning compensation fund.

Summarizing, the trade theory, as well as the new economic geography, advises against regional integration among low income countries or is ambiguous with this respect. Also the empirical studies typically show ambiguous pictures but with findings more in favour of RIAs, see in particular Sperlich and Sperlich (2011) for South-South agreements. One of our main points is that almost all theoretical studies abstract from other long-term targets, for example mechanisms such as political stabilization of regions, which we expect to have an extremely important impact on economic development and which should contribute to intra-regional increase in income and wealth.

Our interest is exclusively focused on South-South agreements, i.e. lower income countries. In our opinion the selected country set represents the world regions in question well, namely South America, South-east Asia, and Central and West Africa. We introduce them by detailed discussions of the countries' GDPpc paths and inequality. There already exist some studies about $\sigma$-convergence for some of the RIAs considered. Hammouda, Karingi, Njuguna, and Jallab (2007) find for 1980-2003 a declining income disparity within the CEMAC and the WAEMU, but not the ECOWAS, see also Jones (2002). For the MERCOSUR, Blyde (2005) finds an increasing income disparity during the 90s, the starting period of this agreement. For ASEAN, Lim and McAleer (2004) consider the five founding members and find increasing income dispersion from 1965 to 1991. We consider much more comprehensive data sets from the beginning of the 70s until 2008, containing all RIA members. After the discussion of each individual GDP path we filter out the business cycles and consider different subsamples to correct for late entries of especially poor or the impact of (suddenly$^2$) very rich countries. The results will be related to preceding findings on growth and convergence revisiting the relation between $\beta$- and $\sigma$-convergence.

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$^2$ For example due to oil discovery.
2. A sample of South-South integration areas

The MERCOSUR (Mercado Común del Sur) consists of Argentina, Brazil, Uruguay, and Paraguay. Venezuela signed its membership in 2006 but is still waiting for an official full admission. Associated members are Chile (since 1996), Bolivia (1997), Peru (2003), Ecuador and Colombia (both 2004). Although this agreement started in 1991 we consider the test period 1985 to 2008 because the integration process began already in 1986 via bilateral agreements. As most industrialized countries strengthened their policy of protectionism after the oil crisis in the 70s, Argentina and Brazil signed a bilateral agreement in 1986, and started negotiations with Uruguay and Paraguay. The claimed targets were the creation of an internal market with a free flow of goods, services, and production factors between the member states. This aim was to be achieved by the reduction of tariff and non-tariff trade barriers, common customs and trade policy, the coordination of macroeconomic and sectoral policy in agriculture and industry, as well as fiscal and monetary policy including exchange rates. After different crises (as the Brazilian crisis 1998/99), the members tried a restart in 2000 (Relanzamiento). Without changing the targets, they intensified their macroeconomic coordination with some success in the formation of an internal market and a customs union. A continuing problem is the weak institutions of MERCOSUR and the differences of trade rules between full and associated members. Since 2005 there has been established a so-called convergence fund to help the poorer regions from which mainly Paraguay has benefitted. Some of the associated members form the ANDEAN group. Figure 2.1 shows the l.p.c. income developments for MERCOSUR plus associated countries. A detailed discussion of each country's growth path and inequality is provided in the appendix. Here we leave it at the graphical presentation.

Not only in poverty and development economics it is broadly accepted today that our interest should also go beyond the averages when looking at income and growth; see for example Ravallion (2001) and references therein. A simple and easily available indicator of the income distribution is the Gini index. Therefore, in Table 2.1 below are summarized the Gini indices for around 1985 (upper line) and for around 2008 (lower line). First, we see that all member states have had a relatively high Gini throughout above 40. We also see that there is no unique development, i.e. for some countries inequality

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3 A RIA founded in 1969. Its members are Bolivia, Colombia, Ecuador, Peru, and until 2006 also Venezuela.
4 According to World Development Indicator in 2012.
5 For comparison: in 2000 it was reported for the USA 40.8, for Germany 28.3, and for Switzerland 33.7
went up while it dropped down for others. On average, inequality has shrunken over all countries (from 51.5 to 50.1) if we do not weight them by population, but slightly increased for the subset of founder states. On the other hand, however, we see here a clear convergence; the dispersion of 7.37 in 1985 among all considered countries has fallen to 5.28 in 2008. A particularly strong convergence we see here for the four founder states where it dropped from 8.35 in 1985 to 5.34 in 2008. Less dramatic it has been among the ANDEAN members where the Gini dispersion between countries went from 6.42 down to 5.07 (not including Venezuela).

**Figure 2.1:** Log per capita income of the MERCOSUR plus associated members

![Log per capita income of the MERCOSUR plus associated members](image)

<table>
<thead>
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<tbody>
<tr>
<td>Argentina</td>
<td>44.5</td>
<td>45.8</td>
<td>59</td>
<td>59</td>
<td>57</td>
<td>57</td>
<td>59.1</td>
<td>51</td>
<td>40</td>
<td>46</td>
<td>43.7</td>
<td>55.6</td>
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<tr>
<td>Bolivia</td>
<td>59</td>
<td>56.8</td>
<td>59</td>
<td>53.9</td>
<td>57.6</td>
<td>49</td>
<td>52</td>
<td>48</td>
<td>42.4</td>
<td>43.5</td>
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<td>Brazil</td>
<td>57</td>
<td>59</td>
<td>57</td>
<td>57</td>
<td>49</td>
<td>52</td>
<td>48</td>
<td>42.4</td>
<td>43.5</td>
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<td>Chile</td>
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<td>51</td>
<td>51</td>
<td>51</td>
<td>49</td>
<td>52</td>
<td>48</td>
<td>42.4</td>
<td>43.5</td>
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<td>Colombia</td>
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<td>Ecuador</td>
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<td>Peru</td>
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<tr>
<td>Paraguay</td>
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<td></td>
<td></td>
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<tr>
<td>Uruguay</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Venezuela</td>
<td></td>
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<td></td>
<td></td>
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</tbody>
</table>

**Table 2.1:** Gini indices for MERCOSUR in 1985 (upper line) and 2008 (lower line)

Our second RIA ASEAN (Association of Southeast Asian Nations) consists of Indonesia, Malaysia, Thailand, Singapore, Philippines, Brunei (since 1984), Vietnam (1995), Burma-Myanmar (1997), Laos (1997), Cambodia (1999), and Papua New Guinea (associated since 1984). It was already founded in 1967, but at that time the cooperation was
only security politics oriented. Annual meetings of the ministers for economic affairs have been held only since 1975 and the character of the cooperation became more economically orientated. Therefore our test period starts in 1975. The cooperation became quite dynamic after the cold war, especially among new entries. More specifically, in 1992 the ASEAN free trade agreement was signed, in 1994 the ASEAN Regional Forum, and in 2007 the ASEAN Charta., a common constitution accounting for the new economic situation, the globalization. ASEAN+3 was founded 1997 in Kuala Lumpur and goes back to a Japanese engagement to give the region a unique political voice and includes Japan, Rep Korea, and PR China. In 2005 New Zealand and Australia commenced free trade agreement negotiations with ASEAN+3 yielding the ASEAN+5. An exact dating of the foundation is hardly possible because Australia and New Zealand had already bilateral agreements with several of the ASEAN+3 countries some years before. Because of missing data we had to exclude Brunei and Burma (Myanmar) completely, while we could not include Cambodia, Vietnam and Laos before the eighties. Figure 2.2 shows the income developments for all ASEAN+5 countries. A detailed discussion of the country's growth paths is given in the appendix.

**Figure 2.2:** Log per capita income of the ASEAN+5 members
In Table 2.2 we show the Gini index for around 2008 (upper line) as well as for the 80s (lower line). The average is 42.1 with a standard deviation of 4.68. In 2008 the Gini of Japan and Korea was 24.9 and 31.6, for Australia and New Zealand 35.2 and 37. We first realize a throughout lower inequality than for Latin America. Even though the Gini changed for all countries over the last forty years, the mean is still at 41.4. What again strikes us is the strong decrease of the dispersion of the Gini between countries which went down from 6.37 to 4.68 without increasing the mean. As before, these numbers refer to the full country set that figures in Table 2.2, abstracting therefore from the countries' real entries and membership in ASEAN.

**Table 2.2:** Gini indices for ASEAN in the 80s (upper line) and 2008 (lower line)

<table>
<thead>
<tr>
<th></th>
<th>Cambodia</th>
<th>Indonesia</th>
<th>Laos</th>
<th>Malaysia</th>
<th>PapuaNG</th>
<th>Philipp.</th>
<th>Singapore</th>
<th>Thailand</th>
<th>Vietnam</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>41.9</td>
<td>36.8</td>
<td>36.7</td>
<td>46.2</td>
<td>50.9</td>
<td>44</td>
<td>42.5</td>
<td>42</td>
<td>37.6</td>
</tr>
<tr>
<td>2008</td>
<td>38.2</td>
<td>40</td>
<td>30.4</td>
<td>48.6</td>
<td>50.9</td>
<td>41</td>
<td>43</td>
<td>45.2</td>
<td>35.7</td>
</tr>
</tbody>
</table>

For Africa, many different and overlapping RIAs exit, from which we chose only some. An important criterion for the selection was the enabling clause of GATT. Therefore, our third country set is composed of the countries belonging to the WAEMU\(^6\), CEMAC\(^7\), or ECOWAS\(^8\). One could have chosen equally well COMESA\(^9\) or SADC\(^10\), the latter being often regarded as quite successful. However, trouble spots like Angola, Congo, and Zimbabwe yield an extremely inhomogeneous pattern over both time and countries. Furthermore, while there are also dissensions about the role of South Africa in the SADC, it is also a fact that some member states have not signed several of the most important protocols for trade liberalization. And COMESA with its 24 member states spread out all over Africa entailing enormous distances and a serious lack of infrastructure, is simply too diverse for considering it as a typical RIA.

This panel starts with the foundation of ECOWAS in 1975 which was ratified through the treaty of Lagos, and is a free trade area since 1999. An important cooperation field is the sectoral programs which aim at an intra-connection of national electric grids and a

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\(^6\) West African Economic and Monetary Union members are Benin, Burkina Faso, Cote d’Ivoire, Guinea Bissau, Mali, Niger, Senegal, and Togo.

\(^7\) CEMAC (Economic and Monetary Community of Central Africa) members are Cameroon, Central African Republic, Chad, Rep. Congo, Equatorial Guinea, and Gabon.

\(^8\) Economic Community of West African States: Benin, Burkina Faso, Cape Verde, Cote d’Ivoire, Gambia, Ghana, Guinea Bissau, Guinea, Liberia, Mali, Mauritania (until 2001), Niger, Nigeria, Senegal, Sierra Leone and Togo.


\(^10\) SADC (Southern African Development Community) established 1992.
regional pipeline for the distribution of natural gas, an improvement of the intra-regional infrastructure as well as a security mechanism. The income developments of its member states are given in Figure 2.3 and discussed in the appendix.

**Figure 2.3:** Log per capita income of the ECOWAS members (West Africa)

![Graph showing log per capita income](image)

The custom and monetary unions WAEMU and CEMAC were both founded 1994. The nominally common currency is the CFA-franc with the central bank BCEAO in Dakar for the WAEMU, and a central bank BEAC in Yaoundé for the CEMAC. The WAEMU has had a regional parliamentary committee and a common court of law since 1998. The cooperation concentrates on the improvement of infrastructure, an efficient energy policy and some macroeconomic coordination to develop common markets, reduce poverty and to combat AIDS. Although Central African CFA-francs and West African CFA-francs have the same peg to other currencies\(^{11}\), West African coins and banknotes are not accepted in countries using Central African francs, and vice versa. Nevertheless, these two areas practice economic cooperation so that we also test for convergence in the CFA-Zone as a whole. Due to the lack of data we had to drop Liberia. We could include Equatorial Guinea, Guinea and Cape Verde only from the mid eighties onwards. Each country's growth path is provided in Figures 2.4 and 2.5 for the two RIAs separately. Detailed discussions can again be found in the appendix.

\(^{11}\) The CFA zone goes back to an initiative of the former colonial power France. It had a fixed exchange rate to the French Franc, and since 2001 to the Euro.
In the Table 2.3 are given the Gini indices for the 80s and about 2008. Further calculations set the missing values equal to the numbers for 2008. As we face three South-South Rias, we have summarized the descriptive statistics in Table 2.4. We see for all RIAs one unique tendency: they do not only converge towards similar Ginis (looking at
the dispersion) but at the same time have succeeded to reduce inequality inside their countries in average, i.e. considering each country as a global player\textsuperscript{12}. Both tendencies are strongest for the WAEMU member states.

**Table 2.3:** Gini indices for West/Central Africa in the 80s (upper) and 2008 (lower)

<table>
<thead>
<tr>
<th>Country</th>
<th>Benin</th>
<th>BurkinaF</th>
<th>Cameroon</th>
<th>C.Verde</th>
<th>CentralA</th>
<th>Chad</th>
<th>CongoR</th>
<th>C.d'Ivore</th>
<th>Gabon</th>
<th>Gambia</th>
</tr>
</thead>
<tbody>
<tr>
<td>80s</td>
<td>--</td>
<td>50.7</td>
<td>46.8</td>
<td>--</td>
<td>61.3</td>
<td>--</td>
<td>--</td>
<td>41.2</td>
<td>--</td>
<td>50.2</td>
</tr>
<tr>
<td>2008</td>
<td>38.6</td>
<td>39.6</td>
<td>38.9</td>
<td>50.5</td>
<td>56.3</td>
<td>39.8</td>
<td>47.3</td>
<td>41.5</td>
<td>41.5</td>
<td>47.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>Ghana</th>
<th>Guinea</th>
<th>GuineaB</th>
<th>Mali</th>
<th>Mauritania</th>
<th>Niger</th>
<th>Nigeria</th>
<th>Senegal</th>
<th>SierraLeone</th>
<th>Togo</th>
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<tbody>
<tr>
<td>80s</td>
<td>35.4</td>
<td>46.8</td>
<td>47.8</td>
<td>36.5</td>
<td>43.9</td>
<td>36.1</td>
<td>38.7</td>
<td>54.1</td>
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</tr>
<tr>
<td>2008</td>
<td>42.8</td>
<td>39.4</td>
<td>35.5</td>
<td>39</td>
<td>38.9</td>
<td>34</td>
<td>42.9</td>
<td>39.2</td>
<td>42.5</td>
<td>34.4</td>
</tr>
</tbody>
</table>

**Table 2.4:** Summary for Gini indices for West/Central Africa

<table>
<thead>
<tr>
<th></th>
<th>CEMAC</th>
<th>WAEMU</th>
<th>ECOWAS</th>
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<tbody>
<tr>
<td></td>
<td>80s</td>
<td>2008</td>
<td>80s</td>
</tr>
<tr>
<td>Means</td>
<td>47.3</td>
<td>44.8</td>
<td>42.4</td>
</tr>
<tr>
<td>Dispersion</td>
<td>7.56</td>
<td>6.47</td>
<td>6.98</td>
</tr>
</tbody>
</table>

Note finally that for the whole of Africa we find no business cycle synchronicity as we do e.g. in ASEAN, see our Figures above. In the next section we concentrate only on the dispersion between the countries inside each RIA, i.e. we will carefully study the sigma paths of the different l.c.p. GDPs.

### 3. Empirical results for sigma-convergence

In order to study the income dispersion and check for sigma-convergence we have to eliminate business cycle effects. This has been done by applying the filter of Hodrick and Prescott (1997) to separate the trend from the cyclical component. We consider

$$\ln y_t = g_t + c_t$$

for \( t = 1, \ldots, T \), where \( y_t \) is GDP per capita, \( c_t \) the cyclical component to

\textsuperscript{12} Alternatively, it could be interesting to see how the entire inequality, say the Gini of each RIA has developed. Note that this cannot be obtained by weighting the singular Gini of each country by its population size. Instead, one could look at the income distributions of each country and aggregate them accordingly. This, however is clearly beyond the scope of this paper as it requires the construction of these distributions over a long period and remains for further research.
be filtered out, and \( g_t \), the growth component of interest. As only the \( y_t \) are observed, the trend has to be calculated via a linear programming problem of the form

\[
\min_{\{g_t\}_{t=1}^T} \sum_{t=1}^T (\ln y_t - g_t)^2 + \lambda \sum_{t=2}^{T-1} [(g_{t+1} - g_t) - (g_t - g_{t-1})]^2.
\]

That is, the filter computes the stochastic trend of interest \( \{g_t\}_{t=1}^T \) by minimizing the sum of squares of its second difference. The parameter \( \lambda \) penalizes the variability in the time series and is fixed in our context to be 100, following the arguments of Hodrick and Prescott. Generally, there is no perfect method to eliminate business cycle effects, because of the natural distortion in the data. In order to assess the impact of the smoothing parameter \( \lambda \) we repeated the study with the three-year moving averages of all unfiltered GDP series to compute the sigma values of all RIAs and country sets under consideration. These studies lead to basically the same results (not shown). The real GDPc.p. in international PPP$ is taken from the World Development Indicator database.

**MERCOSUR**

Figure 3.1 compares the dispersion of income in Latin America. The first line shows a non-monotonous trend of income dispersion for the set of all ten MERCOSUR plus associated states. According to the classical growth model predicting a monotonically decreasing trend of sigma is expected, see next section. Thus, the first sample indicates some convergence since 1985. Even if we compare only the years 1985 and 2008 we find in the set of MERCOSUR plus associates states a lower sigma values for 2008, cf. also Table A.1 in the appendix. In contrast to Blyde (2005) the second line exhibits a divergent sigma trend for the four MERCOSUR founders whereas the values for the ANDEAN have fallen significantly indicating income convergence. Together with the findings of Sperlich and Sperlich (2011) we can confirm therefore beta and sigma convergence in the MERCOSUR and ANDEAN. Poorer countries like Bolivia are growing faster (in percentage) than the richer countries causing beta convergence. Also if we compare the absolute values or the l.p.c. income of the countries over time, we see that the log-income dispersion decreases (compare 1985 with 2008 in Figures 2.1). But for

---

13 This parameter should be approximately the ratio of the variance of the cyclical component divided by the variance of the second differences of the growth components. This gives a value of 1600 for \( \lambda \) when assuming a 5 percent cyclical component and a 1/8 of 1 percent change in the growth rate in a quarter. Therefore in STATA this is the default for \( \lambda \) what refers to quarterly data. For our yearly data we tried 100 and 400 as we partly face emerging markets.
the MERCOSUR founders the gap between poorest (Paraguay) and richest (Argentina) increases from 1985 to 2008. On the other hand, Figure 3.1 (and Table A.1) show that the four MERCOSUR founders have a much lower income dispersion throughout. In the subset of ANDEAN countries we observe a decrease of sigma since 1993. In Figure 2.1 we can see that the gap between the poorest and the richest country of the ANDEAN states stays nearly the same during that period. In fact, only the income level increased for all. Summarizing we realize that in Latin America the (log) income inequality has decreased owing to the relatively higher growth rates of poorer countries causing beta and sigma (i.e. log-income) convergence.

**Figure 3.1**: Sigma trends for Latin America based on HP filtered log-income

![Graph showing sigma trends for Latin America](image)

ASEAN

The empirical outcomes for ASEAN are given in Figure 3.2 and Table A.2. There we see that the income dispersion has increased during the period 1975-2008 from 0.6211 in 1975 to 1.109 in 2008. The upward jumps of the sigma at the beginning of the 80s are due to the entries of new members as for example Brunei. In the 90s these new member states were developing countries like Cambodia, Vietnam, and Laos\(^{14}\). But even if only looking at the five founder states we realize that the dispersion of l.p.c. income rose from 0.6884 to 1.111 during the period from 1975 to 2008. These results are in accordance with those of Lim and McAleer (2004). Like us they also consider the development of sigma without Singapore - today the financial centre of this area but one of the

\(^{14}\) Also Burma (Myanmar) but this country has not been included in the empirical analyses due to the lack of data.
five founders of ASEAN. Without Singapore the sigma of the ASEAN founders decreased until 1990 before it recovered its old mark. Lim and McAleer’s results differ in this point, among other reasons because they studied a different time period and did not eliminate the business cycles. Although we can observe that the poorest country, Indonesia, grew faster than the other founders, implying beta convergence, the income gap between the states slowly widened. In other words, the growth path of the poorer countries did not increase dramatically enough to catch up to cause sigma convergence.

**Figure 3.2:** HP-filtered sigma trends in East Asia

This effect is less pronounced when we consider the enlarged RIAs ASEAN+3 and +5. We see a flattening of the sigma curve after the economic crises in 1997. The Asian crisis slowed down the growth of the new industrialized countries as well as of the high income countries like Japan. All in all we find sigma divergence for ASEAN, +3 and +5. But this conclusion gets relativized if we correct for the late-entries or the special performance of Singapore. As the late entries were developing countries, they first cause a sigma jump upwards before the sigma falls again due to their faster growth. Here, our figures are quite helpful to get a more realistic idea of what actually is going on with respect to income convergence instead of looking at numbers for fixed years.

15 *Founder/Singa* refers to all founder states except Singapore.
West and Central Africa

The empirical results for West and Central Africa are given in Figure 3.3 and Table A.3. CEMAC exhibits the by far highest income dispersion among the selected African South-South agreements. The lowest dispersion we observe for the WAEMU. Sigma convergence of different African RIAs was also studied by Hammouda, Karingi, Njuguna, and Jallab (2007). The income dispersion of ECOWAS falls from 1975 to 1985 but jumps upwards directly after. This is simply caused by the inclusion of Cape Verde in 1986. Currently that country has the highest p.c. income in ECOWAS (cf. Figure 2.3). The dispersion of income continues to increase mainly due to the economic development of Sierra Leone, now the poorest country in the ECOWAS; it has plummeted when in 1991 a civil war began in that country.

Figure 3.3: HP-filtered sigma trends in West- and Central Africa

The WAEMU shows sigma convergence until 2001. Taking this together with the findings of Sperlich and Sperlich (2011) we conclude that here poorer countries indeed grew faster than richer ones (beta convergence) in such a way that the log-income gap among the member states decreased - at least until 2001. As can be seen in Figure 2.4, the absolute distance of the l.p.c. income between the richest and the poorest partners respectively became a little bit smaller. However, we cannot observe a homogenous development. Nations like Senegal and Togo have caught up to the initial regional economic leader Cote d’Ivoire. Some other countries like Burkina Faso have somewhat re-
duced the income gap in relation to the richest partner (note that Togo was the poorest country in 1994). However, Niger has stagnated since the mid 80s, and that of Guinea-Bissau since the mid 90s. We also see also how the recession in Mali increased the income gap within the WAEMU. The countries seem to separate into two convergence clubs, three countries with higher p.c. income, specifically Senegal, Togo and Cote d’Ivoire, and a group of poorer countries. Nevertheless, with a sigma level of 0.59 in 2008 this RIA has the lowest sigma value in West- and Central Africa.

For CEMAC we first find a decreasing sigma until 1993. But then there is a change in the trend and the income dispersion rises. Figure 2.5 exhibits the reason: the economic boom of Equatorial Guinea, driven by oil, compared to relative low growth rates in the other five member states caused an increasing inequality among the members. Consequently, also the CFA-zone as a whole shows sigma convergence until 1993 but divergence afterwards. Moreover, it shows that until the end of the 90s the high l.p.c. income development of Gabon is causing an increasing income inequality. For a better comparison we also calculated the income deviation in 2008 without Equatorial Guinea, see Table A.3 and Figure 3.3. The different sigma curves demonstrate that the sigma increase was indeed only due to the oil fields in Equatorial Guinea.

4. Relating beta- with sigma- convergence

Sperlich and Sperlich (2011) found unconditional and conditional beta convergence in all South-South RIAs that we consider in this paper. Moreover, the analysis showed that membership has had a positive impact on both beta convergence and growth, again for all RIAs considered here. In order to compare these results with sigma development, we have used the same data sets. As is known from the literature and as indicated below, in a linear separable Solow growth model, beta convergence can lead to either a monotone decrease or a monotone increase of the standard deviation when neglecting the business cycles. In other words, sigma divergence is not in contradiction to beta convergence, and thus, sigma divergence would not be in conflict with the findings of Sperlich and Sperlich (2011). There exist several concerns regarding the sigma convergence criterion; all heterogeneity, and even most of the natural dynamics, are ignored. Country- or country group- specific shocks are thus neglected; it simply captures the evolution of cross-section income distribution towards an invariant measure; see discussion of Durlauf, Johnson, and Temple (2005). Or, as Quah (1993) mentioned, sigma convergence
means that each country eventually becomes as rich as all the others – the cross section dispersion diminishes over time. As a consequence, no information is obtained about distribution dynamics within the considered group(s), such as mobility, stratification, and polarization (see also Quah 1996a, 1996b, 1997, or Durlauf, Johnson, and Temple, 2005). Let us revise the relation between beta and sigma convergence starting from the classical unconditional Solow model

$$\ln y_{i,t} - \ln y_{i,t-1} = a - (1 - e^{-\gamma}) \ln(y_{i,t-1}) + \varepsilon_{i,t}, \text{ where } i = 1,2,\ldots,N, \ t = 1,2,\ldots,T,$$

employing common notation denoting by $\ln y_{i,t}$ the logarithm of per capita income of country $i$ and time $t$, a constant $a$, a parameter $\gamma$ which is proportional to the sum of labor force growth, technological progress, and depreciation rate, and finally a mean zero disturbance term $\varepsilon_{i,t}$ to capture heterogeneity over time and between countries. For each period then, $y_{i,t-1}$ is the initial p.c. income. Replacing $(1 - e^{-\gamma})$ by $-\beta$ one has

$$\ln y_{i,t} = a + (1 + \beta) \ln y_{i,t-1} + \varepsilon_{i,t}. \quad (1)$$

For the ease of calculus, the shocks $\varepsilon_{i,t}$ with $E(\varepsilon_{i,t}) = 0$ are typically assumed to be independently distributed over time and space and also homoscedastic, that is they have the same variance $\sigma^2_\varepsilon$ for each country $i$ and time $t$. Clearly, this is a strong and unrealistic simplification with some important implications; see also discussion below. The cross-sectional dispersion of log income is $\sigma^2_t = \text{Var}(\ln y_t)$, can be estimated via

$$\hat{\sigma}^2_t = (1/N) \sum_{i=1}^{N} \left( \ln(y_{i,t}) - \overline{\ln(y_t)} \right)^2. \quad (2)$$

where $\overline{\ln(y_t)}$ is the average of the l.p.c. GDPs in year $t$, and are given in the Figures in the last section, and Tables in the appendix. The variance decomposition of (1), gives

$$\sigma^2_t = \sigma_{t-1}^2 (1 + \beta)^2 + \sigma^2_\varepsilon. \quad (3)$$

If we do not assume that income dispersion tends to zero but consider a steady state of the Solow model instead, in which $\sigma_{t-1} = \sigma_t = \sigma^*$, then

$$(\sigma^*)^2 = (1 + \beta)^2 (\sigma^*)^2 + \sigma^2_\varepsilon \Leftrightarrow \left[ 1 - (1 + \beta)^2 \right] (\sigma^*)^2 = \sigma^2_\varepsilon \quad (4)$$
which is only defined for $-2 \leq \beta \leq 0$. Thus, the steady state variance depends on the shock dispersion and on $\beta$ with $\sigma_{\epsilon} = \sigma^*$ for $\beta = -1$ and $\sigma_{\epsilon} \leq \sigma^*$ otherwise. Plugging-in gives:

$$
\sigma_i^2 = \sigma_{t-1}^2 (1 + \beta)^2 + (\sigma^*)^2 - (1 + \beta)^2 (\sigma^*)^2 \Leftrightarrow \sigma_i^2 - (\sigma^*)^2 = (1 + \beta)^2 [\sigma_{t-1}^2 - (\sigma^*)^2].
$$

(5)

Obviously, if $0 > \beta > -2$ ($\beta$-convergence), then we have convergence of the log income dispersion towards the steady state $\sigma^*$ which is not necessarily smaller than the present sigma. So beta convergence may require sigma divergence. For all the other cases, the equations (4) are not even defined. Moreover, as the shock dispersion $\sigma_{\epsilon}$ is never negative, sigma convergence requires $\beta$-convergence, see (3). For the unconditional Solow model this means that in some of our RIAs, i.e. the ones with sigma-divergence despite beta-convergence, the income dispersion is above the steady state level. But if income convergence is a target of the RIA, then it is natural to assume that the steady state sigma is rather small and definitely smaller than the present dispersion. Therefore both, beta and sigma convergence would then be a wanted target.

Due to our linear model, the sigma evolution to the steady state is supposed to run monotonically, especially when the series have been cleaned from business cycles. In general, however, the sigma should rise or fall depending upon conditional steady states (thinking if the conditional Solow model that includes human capital, investment, etc.) or simply because of heteroscedasticity. In either case, $\sigma_{\epsilon}$ in equations (3) and (4) has to be replaced by a positive function of conditioning variables, say $x$. In case of correlation between these conditioning variables and the past income, (3) and (4) have further to be enlarged by a term containing covariances which might be negative. But notice that already heteroscedasticity of $\sigma_i(x)$ and $\sigma_{i-1}(x)$ will allow for an oscillating adjustment of sigmas to their steady state, no matter whether that is a conditional one or not.

If we assume that all member states of one RIA face the same steady state (i.e. it is sufficient to consider the unconditional growth model), then the upwards shape of sigma curves can be explained by higher steady state dispersion, and oscillating sigmas by heteroscedasticity. If we additionally allow for conditional steady states, then income dispersion can simply increase due to divergent $x$ inside a RIA. Not surprisingly, for income convergence of a RIA it is therefore essential to homogenize the conditions for growth. But this is exactly what we claim South-South RIAs are good for, compare our hypothesis from the first section, and the introduction and discussion of our RIAs.
5. Conclusions

We first have revised the literature on regional integration areas, see Section 1, with a special focus on the criticism against so-called South-South areas. Somewhat in contrast to the exclusively theory based criticism, Sperlich and Sperlich (2011) found empirical evidence for enhanced growth and convergence for the members of these agreements. A main argument that may explain the apparent contradiction is that the theoretical studies always abstract from conditions others than trade, technological transfer or very specific economic factors. As we could see in Section 2 and the appendix, the main factors hindering economic growth and sustainable development in the Southern hemisphere are of political nature, infrastructure, regional coordination, etc. There are further important issues like bargaining power, and necessary social protection to be mentioned which are often promoted by South-South agreements, and can have a positive impact on growth and development. We extended the study of Sperlich and Sperlich (2011) in several aspects. This paper investigates whether we can find the politically quite important question of income convergence in South-South integration areas as the former paper did not say anything about the dispersion of per capita income; the classical growth model predicts only that if there is beta convergence, then the sigma falls or rises (monotonically). As mean income is a quite limited parameter, we have extended our study from income inequality inside a RIA between countries to inequality within countries and how the countries become more similar concerning the Gini\(^{16}\). It turned out that all RIAs succeeded in both reducing inequality in average (taken over the countries) and convergence towards similar income structures.

Let us recall also some specific empirical findings of this paper. While MERCOSUR and ANDEAN have lowest dispersion of per capita income in 2008, CEMAC has the highest dispersion of all South-South RIAs studied. ASEAN has the second highest income dispersion. The reasons are that both CEMAC and ASEAN have an economic “outlier”. The rapid economic development of these two economic leaders (in CEMAC and ASEAN respectively) explains very well the enormous rise of income dispersion in both RIAs. It is hard to assess, whether the enormous economic progress of Singapore or that of Equatorial Guinea has contributed to (or will be conductive to) regional economic dynamism. This dependents on intra-regional trade regulations, FDI flows between the members, and on the functional compensation funds. Note that we observe a

\(^{16}\) as being a condensed information about the income distribution.
relatively short time period as these integration processes have existed only for a few decades. RIAs do not always benefit from such economic leaders. It is possible that the economically strongest country like for example Equatorial Guinea focuses much more on rich industrialized northern countries so that neighboring partner countries cannot benefit from the economic cutting-edge. In fact, Equatorial Guinea’s most important trade partners are - not surprisingly - the USA and the PR China. But because of its insufficient infrastructure this country still depends on the cooperation with the partner members to participate in infrastructure improvement programs.

The MERCOSUR with its associated members indicates an almost monotonically decreasing dispersion of per capita income whereas the sub-region ANDEAN exhibits even a marked decrease. However, it is also clear that the four MERCOSUR founders which have substantially lower income dispersion level than the full sample show rather income divergence than convergence.

In ASEAN the sigma development is characterized by sudden upward jumps due to the entries of new (typically poor) members. Especially at the beginning of the 1980s, there is the excursive increase of the dispersions due to the entering developing countries like Cambodia. Nevertheless, if we abstract from these entries and only look at the five founders we still notice a rise of income inequality since the 1990s. The ASEAN+3 and ASEAN+5 show an oscillating sigma path, maintaining a rather high level as expected. The largest chunk of income dispersion in ASEAN is due to Singapore.

All observed African RIAs show a clear sigma divergence. The ECOWAS has an almost monotonic sigma trend. Recall that the upward-jump 1985 is just because the data of Cape Verde are not available before 1985. The African RIAs have relatively high inequality of income among members. The causes are multifarious with “economic shocks” being one reason for this phenomenon such as the oil-export-driven boom in Equatorial Guinea or the civil war in Sierra Leone.

In the previous section we have given some ideas how beta convergence relates to sigma convergence and how our findings are in accordance with growth models. When we turn to conditional growth models it is obvious that income convergence requires convergence of the framework conditions. At least for Africa, it can be said that around 1960 the RIAs considered were relatively homogeneous regions with respect to their chances and possibilities. The increase in income inequality among partner states has been driven by differences in the speed and success of democratization and industriali-
zation. Consequently, successfully working RIAs can push poorer countries towards growth but the enormous heterogeneity causes income dispersion. Note that we did not perform a counterfactual exercise - there are many reasons why we are convinced this is not possible here - so that our study does not allow to conclude on whether South-South RIAs promote or hinder income convergence. Sperlich and Sperlich (2012) introduce monitoring tools for integration areas where they distinguish between convergence just towards "similarity" or real "development". In both families were included economic as well as political and other factors relevant for sustainable development. They conclude their article by applying their different tools on North-North, North-South, and South-South agreements; while it was less surprising that South-South RIAs converge towards similarity as do North-North RIAs, it was unexpected that they did at least as good as North-North RIAs do concerning convergence towards sustainable development. This, together with our findings in Section 2 explains why RIAs seem to promote growth, beta-convergence and income convergence. We would like to emphasize that this is not in contrast to the existing economic (trade) theory but completes it by further aspects as for example the framework conditions for economic development typically promoted by South-South RIAs.

Political implications are that, in spite of the criticism of Venables (2004), the implementation and expansion of integration policies have a clear positive impact on growth and convergence when they lead to an improved intra-regional infrastructure and promote (intra-regional) trade. The installation of fully functional intra-regional institutions like central banks or common courts also seems to be beneficial. Apart from this, the criticism of Venables (i.e. increasing inequality between countries because of possible agglomeration of industrial manufacturing and unequal costs for liberalization) can be countered by cohesion and compensation funds and an adequate regional policy such as small and medium enterprise promotion etc.

We are aware of the criticism that the lengths of the test periods (in our case the time span the RIAs have been in existence) may be too short to make definitive statements about the convergence process. Part of the literature even assumes that convergence or divergence statements can be made only after several hundred years; cf. Baumol (1986) for example. Following this criticism, however, would mean discarding this statistical indicator for the study of RIA effects.
6. References


APPENDIX: Detailed discussion of the per capita growth paths

A.1. MERCOSUR

After important severance charges conducted by the introduction of the currencies Plano Austro and Plano Cruzado in Argentina and Brazil respectively, the economies recovered only momentarily, and then both countries reached an inflation rate of more than 1000 percent before they used Brady Bonds in 1989 to securitize credits yielding a successful financial restructuring in cooperation with the International Monetary Fund; see Bulmer-Thomas (2003) and Thorp (1998). We then observe a quite steady economic growth until the recession in 1998 and the impact of the financial crisis in 2001, especially for Argentina. Uruguay participated in the Brady Bonds round and also succeeded in stopping its inflation. Having hardly FDIs, but depending mainly on Argentina and Brazil, its economic growth has basically been moving alongside that of Argentina since 1990. Paraguay is the smallest founder of MERCOSUR; its agriculture still makes almost 30 percent of the GDP, and it suffers from the typical Latin America afflictions, namely high inflation, a serious national debt, strong inequality, etc. Since its economic crisis of 1997 the c.p. GDP has stagnated. If we look at the ANDEAN countries, what maybe strikes us most is the different development of Peru compared to the rest, especially from about 1987 to 1995. The reason for this was a bundle of economic reforms towards liberalization (decentralization, opening for FDIs, many ODA17 projects for creation and improvement of infrastructure) after a long period of dictatorships18. These reforms have shown their positive returns since the mid 90s but were realized at that time without an adequate social protection. This provoked serious social inequality and conflicts; see Bulmer-Thomas (2003). Ecuador is the second poorest country of Latin America, 60% of its export is petroleum so that we can see the impact of the OPEC crises in 1986. At the end of the 90s hyperinflation and recession led to a general economic crisis ending basically with the substitution of their own currency by the US$ in 2000. Columbia performed quite well despite the permanent conflicts with drug syndicates and the FARC19. It used its natural commodities for infrastructure and further industrialization. Chile is the second richest country of Latin America behind Argentina but have had a serious problem of inequality (like Brazil, Colombia, and Bolivia) and poverty. Today it has a mainly market oriented system with a treasury rate below 20

17 ODA = official development assistance.  
18 The military dictatorship lasted from 1968 until 1980.  
19 FARC = Fuerzas Armadas Revolucionarias de Colombia
percent. It is the largest exporter of copper; the crumbling of copper prices around 1998 is evident in Figure 1.7. The oil price decline had disastrous consequences for Venezuela where oil export had a share of about 60% of total exports. High national debts, hunger revolts, e.g. in 1989, and the IMF policy (1994-1998) led finally to Chavez’ *socialism of the 21st century* with several nationalizations etc., after 2002 accompanied by economic stagnation and finally recession.

**Table A.1:** Log-income dispersion (for HP-filtered data) in MERCOSUR

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Founder</th>
<th>ANDEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>0.4158</td>
<td>0.3074</td>
<td>0.4244</td>
</tr>
<tr>
<td>1990</td>
<td>0.4398</td>
<td>0.3194</td>
<td>0.4325</td>
</tr>
<tr>
<td>1995</td>
<td>0.4721</td>
<td>0.3584</td>
<td>0.4244</td>
</tr>
<tr>
<td>2000</td>
<td>0.4585</td>
<td>0.3709</td>
<td>0.3600</td>
</tr>
<tr>
<td>2005</td>
<td>0.4042</td>
<td>0.3643</td>
<td>0.2747</td>
</tr>
<tr>
<td>2008</td>
<td>0.3847</td>
<td>0.3750</td>
<td>0.2496</td>
</tr>
</tbody>
</table>

**A.2. ASEAN**

Not surprisingly, among the founders, the city state Singapore has experienced the strongest economic growth. Today, services make about 70% of the GDP. The main reasons are an extremely deregulated financial hot spot and the harbor being an important trans-shipment center for overseas trade. Additionally, Singapore benefits from a high potential biotechnology (Biopolis). In contrast, Indonesia has always been the poorest founder state although it participated in the general upwards trend until the Asian crisis in 1997. Malaysia and Thailand exhibit rather similar p.c. GDP paths except that Malaysia stagnated for three years around 1985. Both have coped with a slow but steady industrialization. Thailand also experienced a slow and difficult process of democratization since the 80s. The Philippines exhibit a serious inequality between the poor agrarian south and the industrialized north (the main island Luzon). In its per capita growth path we see the impact of the economic crisis and riots against the dictator Marcos in the mid 80s, and the eruption of the volcano Pinatubo in 1991. Though now a democratic republic (Marcos left in 1986) the political situation is unstable as the country suffers from Maoist and Muslim guerillas. Note that all ASEAN founders are export oriented and therefore also depend on global business cycles today.
Let us turn to the ASEAN newcomers; Vietnam, Cambodia, Laos, and Papua New Guinea. We will not discuss PR China, South Korea, Japan, New Zealand, and Australia. Brunei and Burma (Myanmar) are excluded owing to the lack of data (Brunei is a Sultanate that does not publish its data; in Burma a military junta has been in power). Although not documented in the figures, it is well known that Vietnam was very poor until the 80s, even to the point of famine. It had a centrally planned economy and suffered embargoes and various consequences of the war. The US embargos ended in 1993 after several economic reforms since 1986 including privatization and liberalization entailing FDIs and finally, as we can see in the figures, a steady economic growth; cf. Minot and Goletti (1998). Laos also started its economic reforms in 1986, a communist planned economy until then, with similar success. We have data for Cambodia starting from 1993 when a democratic monarchy was (re-) established. More than Vietnam and Laos it is an agrarian country with recent economic reforms. Papua New Guinea (assoc. since 1986) has a strong informal agricultural sector and exports mainly agricultural products like cacao and palm oil. Its economy therefore is strongly dependent on world market prices; compare its development path with international price developments.

<table>
<thead>
<tr>
<th>Year</th>
<th>ASEAN</th>
<th>Founder</th>
<th>Founder</th>
<th>+3</th>
<th>+5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>0.6211</td>
<td>0.6884</td>
<td>0.5565</td>
<td>0.9544</td>
<td>1.0985</td>
</tr>
<tr>
<td>1980</td>
<td>0.6431</td>
<td>0.6853</td>
<td>0.4912</td>
<td>0.9296</td>
<td>1.0477</td>
</tr>
<tr>
<td>1985</td>
<td>0.7971</td>
<td>0.6755</td>
<td>0.4146</td>
<td>0.9713</td>
<td>1.0790</td>
</tr>
<tr>
<td>1990</td>
<td>0.8652</td>
<td>0.6763</td>
<td>0.3763</td>
<td>1.0049</td>
<td>1.0936</td>
</tr>
<tr>
<td>1995</td>
<td>0.8868</td>
<td>0.7147</td>
<td>0.4194</td>
<td>1.0095</td>
<td>1.0870</td>
</tr>
<tr>
<td>2000</td>
<td>0.8982</td>
<td>0.8042</td>
<td>0.4888</td>
<td>1.0060</td>
<td>1.0761</td>
</tr>
<tr>
<td>2005</td>
<td>1.0660</td>
<td>0.9866</td>
<td>0.6005</td>
<td>1.1521</td>
<td>1.2160</td>
</tr>
<tr>
<td>2008</td>
<td>1.1091</td>
<td>1.1115</td>
<td>0.6776</td>
<td>1.1808</td>
<td>1.2375</td>
</tr>
</tbody>
</table>

A.3. West and Central Africa

We start by considering CEMAC, Figure A.4. In 1960 Equatorial Guinea, due to its cacao production, enjoyed one of the highest per capita incomes in Africa. In 1996 large oil reserves were discovered. Their subsequent exploitation contributed to an enormous increase in government revenue. However, despite a per capita GDP of more than US$ 30,000 in 2008 (the ninth highest in the world) it ranks 121st (out of 177 countries) on the Human Development Index of the UN. Also Gabon is rich in natural resources. It has an important timber and paper industry, but 80 percent of its export is oil and thus its economy strongly depends on the international oil market. We can detect clearly the
oil crisis in 1979 and the price slumps from 1986 to 1989 when looking at its per capita development. The latter is actually true for basically all CEMAC countries as their exports are mainly based on primary goods. Cameroon had been in recession from the mid 80s until the mid 90s due to an overrated currency, political mismanagement and high corruption (like many African states). In 1994 it started with devaluation and an IMF advised restructuring of their economy. The Republic of Central Africa is very much affected by the civil wars in Sudan, experiencing an enormous migration of refugees. Additionally, their own democratization process went slowly until 1995 due to its many military revolts. Also Chad has been suffering different internal political and military conflicts, except maybe from 1990 to 1999. In the 90s oil reserves were discovered but Chad exported no oil or very little before 2002. Finally, the Republic of Congo had a socialist economy until 1990 with high unemployment and serious external debts. From 1997 to 2002 alone, three civil wars took place.

Before we start to list and discuss the l.p.c. income developments of the members of WAEMU, Figure A.5, one should mention that these countries used the end of the Cold War to integrate into the world market. For most of them this globalization has resulted in a steady economic upturn. Nonetheless, most of these countries are still largely agriculturally oriented. Benin has important external debts. Its cultivation is mainly traditional, the main export goods are cotton and cashew nuts. Burkina Faso is one of the poorest countries in the world, also with important external debts. It has no natural resources and produces mainly cotton and peanuts. After a putsch in 1982/83 and severe riots, it started an IMF adjustment program in 1991. In Mali more than 80 percent of the labour force is dedicated to traditional agriculture entailing a high risk of crop failures. It cultivates mainly peanuts, maize, cotton and sorghum. However, after some economic reforms in 1992, the industrial share of the GDP has increased substantially. Note also that Mali has one of the highest fertility rates in Africa. Cote d’Ivoire is the world’s leader in cacao production and was therefore especially affected by the price decrease for cacao since 1980 followed by economic crises and a civil war in 2002. Besides, it is the only oil-exporting country in the WAEMU; cf. Goretti and Weisfeld (2008) for more details. Togo’s economic situation improved notably after some IMF reforms in 1979. Nevertheless, its economy still depends strongly on its traditional products cacao, coffee and, since 1990, also cotton. But Togo is also an important re-export port for automobiles. Riots and the price decrease of export goods were followed by a recession
in the 90s. Guinea-Bissau had had a steady growth until the beginning of political un-
rests in 1997. Until the mid 80s Niger had implemented a policy of development agen-
cies. Several bad harvests and a quite high fertility rate led to subsequent stagnation. In
contrast to the other WAEMU members, Senegal has a significant industry for the sub-
sequent processing of primary goods, especially for food and textiles. Therefore, though
its main export goods are based on peanuts and cotton, it is less affected by price
changes for primary goods on the world market. Actually, in 2000, primary goods con-
stituted only 2 percent of Senegal’s total export.

Due to the overlapping memberships we have already discussed most of the ECOWAS
members' development (Figure A.6). Since 1983 Ghana has participated in an IMF re-
structuring program with a devaluation of its currency. Its export is dominated by gold,
diamonds, and some agricultural goods. The economic growth of Nigeria is based on oil
exports since the 60s but thwarted by mismanagement, corruption and a military regime
Guinea implemented some economic reforms in 1985, liberalized its rules for FDIs in
1998, and has several joint ventures, especially in the mining sector. Gambia has hardly
any natural resources, acts as a re-exporter instead, but has suffered a recession since
2000. More than 80% of Sierra Leone’s exports are raw minerals. Since 1991, the ex-
ploration of diamonds has decreased due to a civil war, and a main part of its “export”
is simply illegal diamond smuggling. From its independence in 1975 until 1990 Cape
Verde had been a communist system. Then it changed to a neoliberal service-oriented
market economy living from tourism and trade. It has a rather important money transfer
from emigrants amounting to about 20% of its GDP.

Table A.3: Log-income dispersion (for HP-filtered data) for West- and Central Africa

<table>
<thead>
<tr>
<th></th>
<th>CEMAC</th>
<th>(\varepsilon)Guinea</th>
<th>WAEMU</th>
<th>ECOWAS</th>
<th>CFA</th>
<th>(\varepsilon)Guinea</th>
<th>WestAfr.</th>
<th>(\varepsilon)Guinea</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>1.0323</td>
<td>0.4379</td>
<td>0.3881</td>
<td>0.7341</td>
<td>0.6181</td>
<td></td>
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<tr>
<td>1980</td>
<td>0.9143</td>
<td>0.4171</td>
<td>0.3733</td>
<td>0.6522</td>
<td>0.5681</td>
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<td></td>
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</tr>
<tr>
<td>1985</td>
<td>0.7586</td>
<td>0.3857</td>
<td>0.3601</td>
<td>0.5846</td>
<td>0.5213</td>
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<td></td>
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</tr>
<tr>
<td>1990</td>
<td>0.7077</td>
<td>0.3536</td>
<td>0.4351</td>
<td>0.5519</td>
<td>0.5205</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>0.7335</td>
<td>0.3200</td>
<td>0.4742</td>
<td>0.5721</td>
<td>0.5614</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>1.0021</td>
<td>0.8021</td>
<td>0.2899</td>
<td>0.5144</td>
<td>0.7625</td>
<td>0.5655</td>
<td>0.7122</td>
<td>0.5891</td>
</tr>
<tr>
<td>2005</td>
<td>1.2397</td>
<td>0.7586</td>
<td>0.4029</td>
<td>0.5967</td>
<td>1.0102</td>
<td>0.6463</td>
<td>0.8905</td>
<td>0.6437</td>
</tr>
<tr>
<td>2008</td>
<td>1.3140</td>
<td>0.7183</td>
<td>0.5937</td>
<td>0.7126</td>
<td>1.1660</td>
<td>0.7702</td>
<td>1.0103</td>
<td>0.7340</td>
</tr>
</tbody>
</table>

Note: \(\varepsilon\)Guinea indicates that he sigma values after 1995 are calculated without Equatorial Guinea.