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Implications of REACH for Developing Countries

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ABSTRACT
The new European Union (EU) chemicals regulation, the Registration, Evaluation and Authorisation of Chemicals, or REACH, went into effect in 2007. In the extensive advance discussion of the expected impacts of REACH, questions were raised about the effects of this new chemical policy on developing countries. In particular, will it harm the economies of the group of African, Caribbean and Pacific (ACP) countries that historically have been connected to Europe? We found, in brief, that there are only limited, isolated cases where REACH could be problematical for ACP exporters. Almost all ACP exports subject to REACH face insignificant obstacles from the new regulation. Copyright © 2007 John Wiley & Sons, Ltd and ERP Environment.

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Introduction

THE NEW EUROPEAN UNION (EU) CHEMICALS REGULATION, THE REGISTRATION, EVALUATION AND Authorisation of Chemicals, or REACH, went into effect in 2007. In the extensive advance discussion of the expected impacts of REACH, questions were raised about its effects on developing countries. In particular, will REACH harm the economies of the group of African, Caribbean and Pacific (ACP) countries that historically have been connected to Europe?[1] In 2005, the European Parliament commissioned a research project to assess the potential economic impacts of REACH on the ACP states. This article summarizes that research effort.[2]

Under REACH, any substance manufactured or imported in quantities greater than one tonne per year is now subject to registration and testing, with progressively stricter requirements for larger-volume substances. Substances found to be potentially hazardous will require authorization, allowing only specified, controlled uses of these substances in Europe; in extreme cases, very hazardous substances may be restricted (banned) altogether. REACH covers most industrial chemicals and minerals, excluding all fuels, radioactive materials, agricultural chemicals and pharmaceuticals (many of which are covered by other EU regulations).

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[1] On Europe's longstanding economic and political relationship with the ACP states see the work of Robins (1998), Holland (2002) and Adelle *et al.* (2006).
[2] For the complete research report with detailed methodology, data sources and results see the work of Ackerman *et al.* (2006), available at http://www.ase.tufts.edu/gdae/Pubs/rp/Implications_of_REACH.pdf

An extensive database is available from Eurostat, listing exports from each ACP country to the EU. We reviewed the list of export categories (technically speaking, the four-digit categories of the widely used 'Harmonized System' for trade data), identifying all categories that are potentially affected by REACH. Our goal was to err on the side of inclusiveness: when in doubt, we included any borderline or ambiguous cases, excluding only those that we were certain would *not* be subject to registration under REACH. We identified 235 categories of 'REACH exports' – that is, exports to the EU that are potentially subject to regulation under REACH, including all uncertain categories. For each of these 235 trade categories, we downloaded the value in euros, and the volume in tonnes, of exports to the EU-25 from each ACP nation (data were incomplete for a few of the smallest island nations). To reduce the effects of short-term fluctuations in trade data, we calculated the annual average of exports over the years 2002–04.

The following section documents ACP concerns about REACH, followed by a discussion of previous research on environmental standards and development in the next section. ACP economies and their REACH exports are described in the fourth section, while the fifth section examines the nature and size of enterprises that produce REACH exports. The sixth section considers the costs and benefits of REACH for ACP, and the seventh section offers brief conclusions.

ACP Concerns About REACH

The ACP Group of States consists of 79 developing countries that have a long-standing special relationship to Europe. Many of them are ex-colonies that have traditionally received preferential access to European markets. ACP includes all 48 countries of sub-Saharan Africa, plus 16 countries in the Caribbean and 15 in the Pacific.

In 2005, the ACP Council of Ministers adopted a resolution supporting the general goals of REACH, but expressing 'deep concern' about the 'potential negative impact of REACH on exports, particularly in commodities such as minerals and metals, from ACP to the EU'. The resolution also suggested that REACH may have 'adverse effects on other production sectors such as the textile industry'. Furthermore, the ministers stated that they were 'convinced' both 'that REACH will be expensive to implement' and that REACH will have a negative effect on small, medium-sized and micro-enterprises, especially 'emerging small-scale miners'. They expressed concern that the costs imposed by REACH may 'lead to disinvestment from ACP States', potentially resulting in loss of employment for millions of people (ACP Council of Ministers, 2005).

Addressing these concerns, the ACP Ministers asked the EU to exempt ores, minerals and alloys from registration and authorization requirements; to exempt bulk metals from authorization requirements and to reduce bureaucratic requirements and attendant costs for ACP countries.

Unprocessed minerals and ores have since been exempted from registration requirements, but even after this exemption industry groups such as the Chamber of Mines of South Africa continued to express concerns about REACH authorization requirements for ores (Chamber of Mines, 2005). They anticipated that many ores would require authorization, since they contain impurities that are known to be hazardous, such as arsenic in copper ore. Since the proportion of impurities varies widely, even between different batches of ore from the same mine, industry worried that every batch of ore might require a separate authorization. (Asked about this concern, European Commission staff members insisted that a separate authorization for every batch of ore has never been contemplated or proposed. Rather, they anticipate a single authorization for each harmful substance, such as arsenic in copper ore, valid over a range of concentrations.[3])

[3] Personal communication with Fabio Leone, DG-Environment, Brussels, March 2006.

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Standards, Exports and Development

Our study can be seen in the context of previous research on environmental standards and development, although it departs from the familiar paradigm of this literature in a significant respect. As a number of researchers have noted, environmental standards set by Europe and other developed countries have the potential either to harm or to help developing countries (Nadvi, 2003). Rich-country standards can function as barriers to poor-country exports, thus impeding development (Copeland and Taylor, 2004). For example, food safety standards may turn out to play a protectionist role in practice (Henson and Loader, 2001). On the other hand, standards set in export markets may serve as a spur to social and environmental progress for developing country exporters. European retailers have played a crucial role in transmitting information and incentives to their overseas suppliers, as shown in studies of the cut-flower industry (Hughes, 2000), fruit production in Brazil (van der Grijp *et al.*, 2005) and the leather industry in India, Pakistan and elsewhere (Tewari and Pillari, 2005; Khan *et al.*, 2002; Jenkins *et al.*, 2002).

Most of the case studies in the literature are understandably focused on agricultural exporters, or on industries, such as leather, which process local agricultural products; such industries play a large part in the economies of developing countries. In these sectors, it is common to find small-scale producers with limited information about export markets and foreign standards, and limited resources for responding to a changing international context. Questions of asymmetric information become crucial for such producers; the need for technical, and perhaps financial, assistance is clear.

Our study explores a different set of sectors of developing economies, focusing on their production of metals, minerals and chemicals. Almost none of the exports affected by REACH are based in agriculture; the one agricultural product that we examine, essential oils, is the area where we find issues of limited information and the need for assistance to be most important. As we document below, most REACH exports from ACP countries come from multinational corporations or large national companies. The genuine obstacles to exporting that may be faced by the leather industry in Pakistan, or the essential oil producers in Madagascar, do not apply to major British, American and Australian mining companies that own mines located in very poor countries. South African companies with annual turnover in the billions of euros, international operations of their own and listings on foreign stock exchanges bear more resemblance to multinational corporations than to small rural enterprises.

Extensive research has addressed the pollution haven hypothesis – the suggestion that strict regulations in some countries would lead polluting industries to locate in countries with more relaxed standards. Empirical evidence has provided little support for this hypothesis; a common conclusion is that the pollution haven effect is minor at best, and that the costs of compliance with environmental regulations are usually too small to determine plant location (Jenkins *et al.*, 2002; Copeland and Taylor, 2003; Brunnermeier and Levinson, 2004; Copeland and Taylor, 2004). Other factors such as natural resource availability, labour costs and adequacy of infrastructure are more likely to be decisive. Some researchers have reported, however, that with careful statistical technique they find evidence for the pollution haven hypothesis (Jenkins *et al.*, 2002; Copeland and Taylor, 2003; Brunnermeier and Levinson, 2004; Copeland and Taylor, 2004). For most of ACP's REACH exports, the location of production is determined by the location of valuable deposits of ores and minerals; thus the pollution haven questions may not directly apply.

The pollution haven discussion assumes, as does much of the literature on environmental standards, that regulation is on balance a cost to business. The contrary view is expressed by the Porter hypothesis, suggesting that regulation may actually stimulate innovation and benefit the businesses that are quickest to respond (Haq *et al.*, 2001). In particular, it has been argued that REACH is better for innovation

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than the patchwork of regulations that it replaced (Nordbeck and Faust, 2003). We discuss the benefits as well as the costs of REACH for ACP in the sixth section.

REACH and ACP Economies

The Importance of REACH Exports

ACP includes many of the world's poorest countries, as well as South Africa and some smaller countries that are at a middle-income level by global standards. As of 2003, ACP's population of 743 million people represented 12 percent of the world population, while its total GDP of €434 billion was only 1.3 percent of world output. South Africa, by far the largest and most industrialized economy in ACP, accounts for about one-third of the group's total GDP, and two-thirds of the group's REACH exports.

ACP countries are heavily dependent on trade, and have historically strong connections to Europe. Nonetheless, more than two-thirds of ACP exports go to non-European markets, such as North America and East Asia. Exports to all regions amounted to one-third of ACP's GDP, while exports to the EU were €45 billion, or just over 10 percent of GDP, in 2003.

For ACP as a whole, exports to the EU that would be subject to REACH averaged 1.4 percent of GDP in 2002–04. There is, however, wide variation within ACP in terms of exposure to REACH. Fifty-five of the 79 ACP countries have no significant REACH exports, by any of three standards:

- REACH exports are at least one percent of GDP or
- the annual value of all REACH exports is at least €10 million or
- for at least one category of REACH exports the annual volume of shipments exceeds 1000 tonnes.

Only 24 ACP countries meet even one of these criteria. As shown in Table 1, these 24 countries account for more than 99 percent of the value of all REACH exports from ACP. There are several reasons why other ACP countries are so little affected by REACH. Some are primarily agricultural exporters; some island nations have service-based, often tourist-oriented, economies; and some countries depend on exports of products such as fuels that are exempt from REACH. Although in some cases we examine ACP totals, our analysis focuses largely on the 24 countries that meet one or more of the three criteria.

For the group of 24 nations, REACH exports averaged 6.3 percent of global exports in 2002–04; exports to countries outside the EU, and exports to the EU of commodities not covered by REACH, still account for the bulk of exports. In comparison to the size of the national economy, REACH exports were more than one percent of GDP in 11 ACP countries, and were more than ten percent of GDP only in Mozambique and Suriname.

ACP countries are not the only source of imports to the EU that are subject to REACH; in fact, they represent less than one-tenth of the global total. Other developing nations account for four times as much as ACP, while the US and other developed countries account for even more.

Leading Export Commodities

To a remarkable extent, ACP's REACH exports are concentrated in just a few commodities. Tables 2 and 3 show the principal categories of REACH exports, separately for South Africa and for the group of 78 other ACP countries. Some €5.9 billion, more than 90 percent of the total, consists of mining products, as shown in Table 2. In mining, both in South Africa and in the rest of ACP, the top six products represent 95 percent or more of all REACH exports. Gold, iron and steel, aluminium, platinum, cobalt,

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	€ Million	% of GDP	Leading REACH exports
Cameroon	75	0.6	aluminium
Comoros	3	1.0	essential oils
Congo	7	0.2	copper, cobalt
Congo, Dem. Rep.	35	0.7	cobalt, copper
Cote d'Ivoire	18	0.2	essential oils, gold
Cuba	37	0.1	nickel, iron
Dominican Republic	91	0.6	ferroalloys
Equatorial Guinea	46	1.9	acyclic alcohol
Ghana	189	2.8	aluminium, gold
Guinea	54	1.7	aluminium, gold
Jamaica	273	3.7	aluminium
Liberia	1	0.4	ferrous products, gold
Madagascar	16	0.4	essential oils, gold
Mozambique	561	12.4	aluminium
Namibia	10	0.3	zinc, copper
Papua New Guinea	1	<0.1	monocarboxylic acids
South Africa	4238	3.0	gold, platinum
Sudan	48	0.3	gold
Suriname	104	11.4	aluminium, gold
Tanzania	257	2.8	gold
Trinidad and Tobago	190	2.0	acyclic alcohol, ammonia
Uganda	13	0.2	gold
Zambia	64	1.6	cobalt, copper
Zimbabwe	100	1.3	ferroalloys, nickel
55 other ACP countries	41	<0.1	
ACP total	6472	1.4	

Table 1. REACH exports for selected ACP countries (2002–04 average)

copper, manganese and nickel together account for the overwhelming majority of REACH exports from ACP.

Chemical exports amount to €0.6 billion, about half from South Africa, as shown in Table 3. South Africa has a diverse range of chemical exports; in contrast, chemical exports from other ACP countries are concentrated in just a few categories. The top six products account for 90 percent of the non-South Africa chemical exports, and almost half of the total consists of acyclic alcohols, i.e. methanol and ethanol.

REACH regulates chemicals and mineral products based on the volume of sales in Europe, with stricter regulation for higher volumes. Most ACP countries have very few REACH exports in the top volume tiers, for which REACH registration and testing requirements are the most demanding. The only countries with more than two export categories in the top tier, above 1000 tonnes per year, are South Africa, Cuba, Trinidad and Tobago, Zambia and Zimbabwe. The only countries with more than 20 export categories above REACH's one tonne minimum threshold for regulation are South Africa, Cuba, Côte d'Ivoire, and Trinidad and Tobago. All of the 24 countries have a very small number of major REACH exports: the one or two top categories, shown in Table 1, account for at least 63 percent of each country's REACH exports, and at least 90 percent for 16 of the countries.

Mineral and metal products are the dominant REACH exports for 18 countries, including South Africa. In Equatorial Guinea and Trinidad and Tobago, acyclic alcohols and ammonia, by-products of the oil industry, are the top REACH exports. (In both countries, petroleum, which is not covered by

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	€ million	%
South Africa		
Gold	1993	51
Iron, steel, ferroalloys	1005	26
Platinum group metals	682	17
Aluminium, aluminium oxide	59	2
Copper	35	1
Manganese, manganese oxides	33	1
All other	122	3
All REACH mining exports (South Africa)	3929	100
All other ACP countries		
Aluminium, aluminium oxide	1041	53
Gold	538	27
Iron, steel, ferroalloys	175	9
'Chapter 81' (unspecified metals)*	50	3
Cobalt	48	2
Nickel	26	1
All other	90	5
All REACH mining exports (other ACP)	1969	100
ACP total: REACH mining exports	5898	

Table 2. REACH mining exports (2002–04 average)
* Primarily cobalt and manganese; primarily exported from Zambia and Democratic Republic of Congo.

	€ million	%
South Africa		
Acyclic hydrocarbons	29	9
Reaction initiators	22	7
Prepared binders	18	6
Hydrazine, hydroxylamine and their inorganic salts	18	6
Salts of oxometallic or peroxometallic acids	15	5
Organic composite solvents	15	5
All other	192	62
All REACH chemical exports (South Africa)	310	100
All other ACP countries		
Acyclic alcohols	122	46
'Chapter 29' (unspecified organic chemicals)*	61	23
Ammonia	20	8
Essential oils	20	7
Heterocyclic compounds	12	4
Colouring matter	4	1
All other	27	10
All REACH chemical exports (other ACP)	265	100
ACP total: REACH chemical exports	575	

Table 3. REACH chemical exports (2002–04 average)
* Exported almost exclusively from Trinidad and Tobago and Equatorial Guinea; probably oil industry by-products.

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REACH, is the largest export to Europe.) The principal REACH exports from four countries include plant-based products: essential oils from Comoros, Côte d'Ivoire and Madagascar, and monocarboxylic fatty acids, derived from palm oil, from Papua New Guinea.

South Africa

ACP's leading exporter is its largest economy, South Africa. Only one-quarter of South Africa's exports to the EU fall under REACH. Coal and diamonds, the country's top exports to Europe, and many manufactured and agricultural exports are not affected. In REACH export sectors, South Africa is the fourth-largest supplier of iron and steel to the EU, has a diversified, growing chemical industry and has the largest mining sector in ACP (European Commission, 2004). We identified more than 200 REACH export categories in South Africa, far more than in any other country.

Most of South Africa's REACH exports consist of metals – particularly gold, platinum group metals, and iron and steel products. The country is the world's largest producer of both gold and platinum. In gold, South Africa has 40 percent of world reserves and produced 14 percent of world output in 2004. In platinum, South Africa is even more dominant, with 88 percent of world reserves and 58 percent of world output in 2004 (Directorate of Mineral Economics, 2005). In iron and steel, South Africa produced 40 million tonnes of iron ore in 2005 (3 percent of world output), of which 25 million tonnes were exported as ore and 15 million tonnes were used locally to produce steel or ferroalloys. South Africa is the 19th largest steel producer and the eighth largest net exporter in the world (SAISI, 2006).

The largest REACH export from South Africa's iron and steel industry is ferroalloys, an intermediate product consisting of iron alloyed with elements such as chromium, manganese and silicon that add desirable properties for steel-making. In 2004, South Africa produced 4.3 million tonnes of ferroalloys, almost one-fifth of world production, and second only to China in volume (Jorgenson *et al.*, 2004). Exports amounted to at least 3.4 million tonnes in 2004, or about 80 percent of production (Directorate of Mineral Economics, 2005). Under REACH, alloys are treated as mixtures: when alloys are imported into Europe, each of the substances in the alloys must be registered. There are, however, only a limited number of substances used in ferroalloys. Ferrochromium makes up 72 percent of South Africa's ferroalloy production, and ferromanganese and silicomanganese another 23 percent (Jorgenson *et al.*, 2004).

South Africa's chemical industry employs 200 000 people, accounting for €7 billion of value added, more than 4 percent of GDP.[4] Its growth has been driven by the demand for explosives in the mining industry, the abundance of cheap coal and the political environment of the apartheid era (before 1994), which put a premium on national self-sufficiency (South Africa Department of Trade and Industry, DTI, 2005). However, most of South Africa's chemical production is in product lines that are exempt from REACH: liquid fuels, plastics, rubber and pharmaceuticals account for 64 percent of the industry (DTI, 2005, pp. 14, 20).

South Africa is a net importer of chemicals, largely due to its imports of pharmaceuticals and fine chemicals. At the same time, it is a significant exporter of other chemical products. Most of South Africa's chemical exports to Europe are basic industrial chemicals, with a smaller quantity of finished products such as cosmetics and inks. No single product or small group of products dominates the list, as seen in Table 3; rather, there are exports of moderate quantities of a variety of industrial chemicals. Only 21 percent of South Africa's chemical exports go to the EU; markets in Africa, Asia and North America are more important to the industry.

[4] An exchange rate of 7.5 rand = 1 euro is used to convert South African data to euros throughout this article.

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Multinationals Versus Local Producers

The Role of Big Exporters

The great majority of ACP REACH exports are exported in large quantities by large companies. These firms should have no more trouble than European companies in complying with REACH; indeed, in some important cases, they *are* European companies.

In South Africa, the largest producers of gold, platinum and iron ore are subsidiaries of the British mining giant Anglo American, as is one of the major steel companies. Other mineral exporters include large South African companies that have become multinational firms with overseas operations of their own. In the chemical industry there are three dominant firms, one a subsidiary of Dow Chemical. The other two are South African firms that are large by world standards; one of them has annual turnover of €9 billion and is listed on the New York Stock Exchange. A handful of smaller producers are also active in niches in the chemical industry, including subsidiaries of other multinationals as well as local companies.

The role of foreign multinationals in REACH exports is also paramount in the rest of ACP. For example, in aluminium production, Mozambique's exports come from a joint venture led by the Australian mining company BHP Billiton, in partnership with Mitsubishi and government agencies of South Africa and Mozambique. Alcan, the Canadian multinational aluminium producer, is active in Cameroon, jointly with the government. Alcoa, a leading US firm, produces aluminium in Jamaica and Suriname, in some cases jointly with government agencies and/or BHP Billiton. We did not find any evidence of small aluminium producers or exporters.

Small-Scale Gold Mining

A similar picture can be seen throughout ACP's other metal and mineral exports, with one exception. In several gold-producing countries, small-scale or artisanal gold mining exists alongside major commercial mines. Large numbers of people are engaged in searching for gold with only rudimentary tools, under 'gold rush' conditions where most participants earn very little. This style of mining apparently does not occur on a large scale in South Africa, or in mining for anything other than gold.

Serious issues of poverty, economic development and environmental health are raised by artisanal gold mining. Yet the existence of these impoverished freelance miners does not imply that gold (or any other mineral) is exported to Europe by ACP micro-enterprises. Small-scale gold miners sell their gold either on the black market, or to national government agencies that export gold to Europe. In Tanzania, the country best known for artisanal gold mining, three-quarters of the nation's gold output comes from subsidiaries of Anglo American and other multinationals, and one-quarter from hundreds of thousands of artisanal miners. The national government is obligated to buy the gold produced by the small-scale miners, and is building a government-owned gold refinery to handle their output. Thus it is the government of Tanzania, not the individual miners, that exports the country's artisanal gold to Europe.

Small Exporters and Essential Oils

Multinational corporations, large national firms and government agencies account for most of ACP's REACH exports – but not quite all. In the essential oil industry, producers, exporters and even European importers are often small and medium-sized enterprises. Essential oils are products of plants giving

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the odours and tastes characteristic of the particular plant, such as cinnamon and lavender. Plants for essential oils are often grown by small-scale farmers, who sell their products to companies with distillation and packaging facilities (FAO, 2001). Six ACP countries averaged more than 50 tonnes of essential oil exports to EU in 2002–04. We looked in detail at the industry in Madagascar and Comoros; in both cases, the sector appears to consist entirely of small to medium farmers and manufacturers.

Madagascar is the largest essential oils exporter to the EU after South Africa, sending an annual average of €6 million of essential oils to Europe in 2002–04. Vanilla is one of Madagascar's most important exports, but essential oils from many other plants are also being established as export products, including ylang ylang, clove, palmarosa, geranium, niaouli and helichryse. Growing consumer interest in essential oils has spurred production. Currently 80–90 percent of the oils are produced for export, and are exported 'raw' due to the lack of manufacturing infrastructure (FAO, 2001; Madagascar Consulate, 2006). The international aid community, including agencies such as GTZ, USAID and UNIDO, has been active in Madagascar for more than a decade, with several major aid projects aimed at developing the industry. A USAID-sponsored program lists about 20 small to medium-sized companies that produce essential oils or related substances (BAMEX, 2005).

In Comoros, sometimes called the Perfume Isles, essential oils account for 98 percent of REACH exports. Comoros exports 80 percent of the world's supply of ylang ylang essence, a main ingredient in many perfumes. The essential oil of vanilla is another important export. Distilleries use their own crops but also buy from smaller farmers, since producing for the export market requires quality controls of the distilled products and registration processes that most small farmers cannot afford on their own (Grainger, 2005).

The importers and suppliers to the EU will bear the costs of meeting REACH requirements for essential oil imports, and it has been suggested that the ability to comply with REACH could become a decisive determinant in importers' selection of suppliers (Jones, 2005, p. 20). The European Federation of Essential Oils, which represents importers to the EU and producers in the EU, has emphasized that their 150 members are mainly small and medium-sized enterprises and would have difficulty complying with REACH. They advocated, unsuccessfully, for exempting essential oils from REACH (EFEO, 2005).

However, the overall costs of REACH compliance for the essential oil industry will be low; there are only a limited number of essential oils exported from ACP to the EU in quantities affected by REACH. According to one estimate, there are 300 essential oils sold in the EU, of which 170 are exempt from REACH because they are produced in amounts less than one tonne per year. Another 120 essential oils are below 100 tonnes per year and exporters, therefore, have 11 years to complete their REACH registration. Only ten essential oils fall in the higher-volume range requiring registration within six years, and more extensive testing. Since safety and toxicity information is available for many of the best-known products, registration should not be unduly burdensome (Jones, 2005, p. 19).

Costs and Benefits of REACH for ACP

REACH has both costs and benefits for ACP. The costs are principally those of registration and testing for exports that are subject to REACH, plus any economic disruption or losses caused by the regulation. The direct costs are small enough, and the producing and exporting enterprises are in most cases large enough, that we expect little or no economic losses in the ACP countries as a result of compliance with REACH. The benefits include increased knowledge of chemical hazards and safety, improved protection of workers' health and the natural environment, and potentially reduced liability for future damages.

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Costs of REACH for ACP Exporters

Numerous studies have been conducted on the costs of implementing REACH. A summary of 36 early studies, published in 2004, found that the estimated total cost of REACH is between €2.4 billion and €3.9 billion over an 11 year implementation period (Witmond *et al.*, 2004).[5] Later changes in REACH were predominantly in the direction of lowering requirements and costs, implying that early studies of costs may now represent overestimates. One of the most recent detailed studies was done by the consulting firm KPMG, jointly commissioned by the chemical industry and the European Commission. KPMG estimated registration and testing costs per substance, ranging from €15 000 for the lowest volume tier up to €323 000 for an individual registration, or €185 000 if two companies share the cost, in the top volume tier (KPMG, 2005, p. 7). Use of available published information on chemicals, and sharing of costs among more than two companies, will often lower costs still further, making the true costs of compliance even lower than the KPMG estimates.

We estimated the costs of REACH for the top 24 ACP exporters by applying the KPMG costs per substance to the REACH export data. The results of our calculation are shown in Table 4. The estimated total cost is about €50 million, or €4.6 million per year over the 11 year phase-in period.[6] South Africa's exports would bear more than half of this cost, about €2.8 million per year. The next largest costs, more than €200 000 per year, would fall on Cuba and on Trinidad and Tobago. In all other countries, the costs would be less than €120 000 per year.

The annual costs estimated in Table 4 amount to less than 0.1 percent of the value of REACH exports for the 24 countries as a whole. The costs exceed one percent of the value of REACH exports only in the Congo, Liberia and Papua New Guinea, each of which has REACH exports of less than €10 million per year.

In Liberia, the only country where estimated REACH compliance costs exceed two percent of the value of REACH exports, the data may be particularly unreliable. Liberia, best known in world trade for exports of rubber and timber, and for low-cost ship registrations, was engulfed in civil war during much of 2002–04, the period covered by our data. Thus reports of small quantities of several different REACH exports from Liberia, varying widely from year to year, may represent either re-export of goods produced elsewhere, or simply data errors. The data as reported, however, create an image of a country exporting a diversity of REACH products in small quantities, the worst case for REACH compliance costs.

Similar data issues may account for the extremely small REACH exports reported by some of the other ACP nations, beyond the top 24. Of the 50 other ACP countries that reported any REACH exports, there were 22 with national totals of less than €100 000 per year. If these represented genuine micro-industries exporting products subject to REACH, then REACH compliance could impose a substantial burden in percentage terms; on the other hand, technical and financial assistance to such industries would be inexpensive, due to the minute scale of the exports. However, many of these reported exports are too small to be significant, even in a small national economy. It seems plausible that occasional re-exports or data errors are involved here as well.

Even in the sector with the broadest range of REACH exports, South Africa's chemical industry, REACH compliance is unlikely to pose a major challenge. The South African government's 2005 industrial strategy, analysing in some detail the prospects for expansion of the chemical industry, did not list European

[5] A handful of business-sponsored studies have come up with vastly higher estimates. A detailed critique of the most important business study is presented by Ackerman and Massey (2004).

[6] This calculation, presented by Ackerman *et al.* (2006), assumes that four-digit export categories represent individual substances regulated under REACH, except in the case of South Africa's chemical industries, where we used eight-digit categories to reflect the much greater diversity of exports. While four-digit categories sometimes aggregate multiple REACH substances, the opposite problem arises with eight-digit categories: especially in metals, a single REACH substance may be spread across multiple eight-digit categories. In a subsequent calculation using eight-digit categories for all REACH exports, but consolidating multiple categories representing the same metal, we estimated a total compliance cost of €70 million for the top 24 ACP exporting nations.

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	11 year total compliance cost (€1000)	Annual compliance cost (€1000)	Annual cost as a percentage of REACH exports (%)
Cameroon	941	86	0.10
Comoros	106	10	0.40
Congo	811	74	1.10
Congo, Dem. Rep.	1010	92	0.30
Cote d'Ivoire	1180	107	0.60
Cuba	2783	253	0.70
Dominican Republic	1203	109	0.10
Equatorial Guinea	400	36	0.01
Ghana	1035	94	0.05
Guinea	751	68	0.10
Jamaica	626	57	0.02
Liberia	335	30	4.60
Madagascar	473	43	0.30
Mozambique	806	73	0.01
Namibia	659	60	0.60
Papua New Guinea	186	17	1.90
South Africa	30629	2784	0.10
Sudan	15	1	0.00
Suriname	688	63	0.10
Tanzania	1102	100	0.04
Trinidad and Tobago	2396	218	0.10
Uganda	226	21	0.20
Zambia	1248	113	0.20
Zimbabwe	1010	92	0.10
Total	50616	4601	0.07

Table 4. Estimated cost of REACH for ACP

regulation as one of the important obstacles. It did, however, express South Africa's commitment to meeting developed country environmental standards as its chemical industry grows (DTI, 2005).

The central quantitative finding here is the small size of REACH compliance costs, with average annual costs on the order of one-tenth of one percent of the value of REACH exports. Businesses routinely experience and cope with cost changes of much more than one-tenth of one percent. No sensible enterprise changes its plans about where to locate its facilities, or decides to abandon a market as large as the EU, in response to the tiny percentage changes in costs that will result from REACH. Prices of energy, materials and equipment, and the availability of infrastructure and skilled labour, are much larger influences on production and investment decisions. In the case of ACP's REACH exports, of course, the existence of ores and mineral deposits is often the deciding factor for the location of production.

The low cost of REACH compliance may come as a surprise to those who are accustomed to discussion of regulatory cost burdens. Yet our low estimate is consistent with other research findings on regulatory costs. *Ex ante* estimates of the costs of regulatory compliance, often based on estimates by the regulated industry itself, routinely turn out to be higher than actual, *ex post* costs. This has been confirmed in research in Europe (Bailey *et al.*, 2002; Sherrington and Moran, 2007) and in America (Goodstein, 1999; Harrington *et al.*, 2000; Ackerman, 2006). In this instance, the industries that are affected by REACH, in Europe and in South Africa, expressed grave concern in advance, suggesting that costs might be enormous. However, after years of research and debate, there are no credible, published estimates of REACH compliance costs that are large enough to justify these concerns (Ackerman *et al.*, 2007).

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Benefits of REACH for ACP

There are benefits as well as costs of REACH, both in the EU and in ACP countries. Regulation of hazardous chemicals should not be viewed as a rich country's luxury imposed on low income exporters. Some of the greatest beneficiaries of REACH could be businesses and workers in developing countries.

Businesses will gain access to crucial information about the effects of their products and the materials and substances they use; this will help them to identify and adopt safer alternatives, when needed, and to avoid future liability for damages. Public health will be improved by better information and appropriate limits on chemical exposures. A World Bank report reviewed the scientific literature on the subject, and concluded that toxic chemicals are a significant and growing threat to health among the poor in developing countries. Resulting in part from toxic exposures, chronic diseases are emerging as an increasingly important source of illness in developing countries, and are expected to exceed the burden from infectious disease by 2020 (Goldman and Tran, 2002).[7]

Workers in particular will benefit because many chemicals pose greater hazards to the employees who handle them on a daily basis than to the consumers of finished products. This could be important both in the chemical industry itself and in industries that use chemicals in production. Some of these industries, such as textiles, are increasingly concentrated in developing countries. If REACH generates important health and environmental safety information about chemicals used in textile production, developing countries will be better able to adopt occupational exposure standards that ensure worker safety and reduce the rate of occupational illness.

Compliance with REACH will also facilitate developing countries' efforts to create domestic systems for sound chemicals management. Many developing countries have only rudimentary systems for chemicals management, or have no legislation and administrative capacity on chemicals at all (Gärtner *et al.*, 2003). It is important for developing countries to draw on the infrastructure that already exists for chemical information management in industrialized countries, in order not to reinvent the wheel.

Conclusions

Are developing country exporters placed at a disadvantage by European regulations? Is there a need to provide information and assistance to overcome this disadvantage? These understandable concerns typically emerge from studies of one common market structure: industries in which small local firms in developing countries are producing or processing agricultural products for export. There are a few cases where this market structure applies to ACP exports affected by REACH, notably in essential oils. In those rare cases where small and medium-sized firms are exporting products affected by REACH, assistance from the EU or from national or non-governmental agencies may be necessary for a smooth transition to REACH compliance. The cost of such assistance will be limited because there are so few export sectors where small enterprises are involved.

Almost all of the ACP exports affected by REACH, however, follow a different pattern: huge multinational companies are exporting metals and minerals from mines that are located in developing countries. The great majority of exports affected by REACH – 88 percent in South Africa and 85 percent in ACP as a whole – consist of a small number of metals: gold, platinum group metals, ferroalloys and aluminium. Costs to register this short list of well known major products will have minimal effects on the large-scale industries that produce and export them. In ownership, financial resources, technical capability and access to information, multinational exporters of metals and minerals do not resemble a developing

[7] In addition, several recent studies have estimated health and safety benefits of REACH to the EU in the billions of dollars per year (European Commission, 2003; RPA, 2003; Von Bahr and Jason, 2004; Pedersen *et al.*, 2005; Pickvance *et al.*, 2005).

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country's small local enterprises. In some cases, the same firms also export the same products from North America, Australia and other locations.

REACH was modified in response to developing country concerns, as expressed by ACP and others, in the long debates before adoption. We find no need for further modifications to REACH in order to preserve developing countries' interests. While it is often important to provide developing countries with special protections in international trade, it is equally important to ensure that developing countries benefit from the information about chemicals that will be generated under REACH. Overall, we conclude that compliance with environmental regulations such as REACH poses little or no risk to the economies of developing countries, and may in the long run provide significant health and safety benefits not only to Europe, but also to its trading partners.

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