

Europe, and Japan.<sup>10</sup> In functional ceramics (materials that exploit an electrical, optical, magnetic, or related property) a number of small firms have successfully produced for the defence industry, but have also suffered from the vulnerability that dependence on a single client implies.

In general, Canadian producers of advanced industrial materials have one important advantage: the production of advanced industrial materials is typically energy intensive and Canada has low energy costs. Canadian producers labour, however, under a substantial disadvantage: a number of other countries -- in particular Japan -- have invested very substantial funds in research and development (R&D) in advanced industrial materials and as a result their firms have a marked technological lead.

### 1.3 Pharmaceuticals

The pharmaceutical industry is divided between a number of large multinationals producing both patented and off-patent, over-the-counter and ethical prescription drugs and a small number of manufacturers of generic substitutes, the two largest of which are Canadian owned (see Table 1). The generic sector grew in response to the Canadian Patent Act of 1969, which provided for the compulsory licensing of generic substitutes for patented ethical drugs in exchange for a 4 per cent royalty payment to the patent holder. Bill C-22 was passed in 1987 and dramatically changed the situation. On new products it gave brand-name manufacturers 7 to 10 years' protection against generic substitutes. The industry is still adjusting to these changes.<sup>11</sup>

The industry has the following characteristics. First, very little of the fine chemicals that are the primary active ingredient of pharmaceuticals are produced in Canada. These are usually

manufactured in the country of origin of the multinational, at important market locations, and in parts of the world that combine low labour costs with generous tax treatment of foreign investors (e.g. Ireland, Puerto Rico).<sup>12</sup> Second, Canadian plants are largely oriented to the Canadian market and operate on what, by international standards, is a rather small scale.<sup>13</sup> Thus, while pharmaceuticals account for a larger share of chemical industry factory shipments than resins and elastomers (Figures 1 and 2), they have a small export presence (Figure 8). In 1988 the industry exported products worth \$175 million, as compared to factory shipments of \$1.7 billion. Of those exports, less than \$31 million went to EC countries.

The FTA may modify this situation somewhat. Part of the Canadian output can qualify for tariff reduction under the FTA rules of origin. This is the case if the costs of materials of North American origin plus the direct cost of processing in the territory constitute 50 per cent or more of the value of the finished product when exported. However, a product cannot qualify for free trade treatment if manufactured by taking a medicine of third country origin made of two or more constituents already mixed for therapeutic or prophylactic uses and preparing it in a measured dose or form for retail sale.<sup>14</sup> The FTA is expected to have a modest effect on the export activities of the Canadian pharmaceuticals industry.

Bill C-22 and the FTA have changed and will continue to change the circumstances of the Canadian pharmaceuticals industry. In addition to these particular changes there are other changes that apply to the industry worldwide. First, governments throughout the world are attempting to control spiralling health care costs, of which prescription drug costs are a major component. Second, a substantial proportion of profits in the industry has been based on a number of products patented in the early 1960s. In fact, over half of the 50 most prescribed drugs