THE DEFUSION OF TECHNOLOGIES FOR FUEL SAVING AND EMISSIONS CONTROL TO DEVELOPING NATIONS

Pari Patel (SPRU, University of Sussex) and Paul L. Robertson (University of Wollongong)


As a result of increased levels of pollution due to the proliferation of automobiles following the Second World War, automotive manufacturers were induced to turn their attention to the development of emissions-control devices. In many cases, this move was a direct result of legislation, or the threat of legislation, in Japan and in high-income countries in Europe and North America. In the 1970s, this concern for pollution was reinforced by the two petroleum “crises” that demonstrated the vulnerability of oil-hungry developed economies to fuel shortages. The upshot was a substantial increase in the efforts of the major automotive manufacturers to develop vehicles that produced fewer atmospheric emissions. This was expressed through two major technological drives: (1) Controls over the production of emissions by reducing fuel consumption and improving the efficiency of internal combustion engines; and (2) the development of devices such as the catalytic converter that could “clean” the remaining emissions.

In this paper, we concentrate on the flow-on effects from these technological developments to dealing with emerging conditions in developing economies. Since the 1980s, motor vehicles have proliferated in a number of countries, notably in Asia and parts of Latin America. Among the consequences of the spread of the internal combustion engine are increased petroleum consumption (and thus balance of payments difficulties) and air pollution from developed to developing nations. The question that we are addressing is the extent to which technologies intended to cope with these issues in the West (including Japan) have been implemented elsewhere as the problems associated with the use of motor vehicles have proliferated.

We distinguish between two main types of incentives for the spread of new technologies in these areas. The first group of incentives is those associated with regulations introduced locally to deal with pollution and excessive fuel consumption. Secondly, firms may voluntarily introduce various improvements for strategic reasons – for example, they may use low levels of fuel consumption as a marketing point. Moreover, practices may differ according to the broader strategies followed by firms. To the extent that motor vehicle manufacturers attempt to sell uniform models in many markets (a characteristic most often associated with Japanese firms), the development of technologies intended to deal with problems in their home markets may be expected to diffuse rapidly to other markets. If, however, a producer is more willing to tailor models to perceived individual needs in each market, the diffusion of technologies may be slower – if, for instance, the extra costs associated with new technologies is seen to be so great as to undermine an ability to sell in markets that are regarded as being highly price-sensitive.

Our study is based on diverse sources. Firstly, we have used the SPRU U.S. patent base to examine patterns of patenting by motor vehicle manufacturers and components suppliers since the late 1960s. From this, we have been able to determine which areas have received attention over the period, broken down according to the domicile of the developing firms (North America, Japan or Europe). We then look at patterns of diffusion of various relevant technologies developed over the period and attempt to establish the extent to which the use of various devices has been influenced by regulatory regimes or by strategic decisions made by the firms for other reasons.