Economies of scale in the automobile industry

Recent discussion of productivity in the automobile industry has been focused on the rise of flexible manufacturing, even suggesting that this phenomenon now takes prominence in defining the costs of production. However, flexible manufacturing does not redefine the production technology but is instead a method for more fully utilizing it. Truett and Truett (2001) assert that the presence of economies of scale in the automobile industry continues to be a significant factor for companies, recommending that the Spanish industry, for example, would find cost advantages in expanding. The expansion would not necessarily be uniform across all the production processes, since each process can have a distinct MEPS.

There are four processes that comprise the production of automobiles, as described by Rhys (1972), Wells and Rawlinson (1994), and Wells and Nieuwenhuis (2001):

1. R&D: involving the proposal for a new vehicle and development for production.
2. BIW: the pressing of steel sheets into vehicle body panels, which are then welded together to form the load-bearing vehicle body.
3. Powertrain: the fabrication of engines and transmissions using forge, foundry, and machining techniques.
4. Final assembly: painting of the BIW in the paintshop, subassembly of major components, and final assembly of the complete vehicle.

Pressing and powertrain production use specialized manufacturing processes as dictated by the nature of the product, and so are capital intensive. Pressing is the most specific to the automobile industry because it stamps out panels from sheets of steel which are subsequently welded together to form the load-bearing structural bodyshell, known in its pre-assembly unpainted state as the BIW. Assembly is a logical sequence of activities that has developed over time and tends to be more labor intensive. Vehicle
design is a knowledge-based activity encompassing all the R&D necessary to bring a new model to the point of production. R&D is dependent upon human knowledge, aided by physical prototypes and, increasingly, information technology (IT).

As distinct activities, each process has its own economies of scale. Husan (1997) stated that the MES has changed as the industry has developed, notably between the years 1958 to 1975. It is tempting to agree that manufacturing has become more capital intensive but it does not necessarily follow that technical progress leads to greater economies of scale. It may instead lead to a flattening of the LAC curve for the plant, allowing the MES to be gained at lower output levels than previously, particularly with the rise of flexible manufacturing. Indeed, in reviewing the four main processes, Rhys (1999) took the view that economies of scale in panel pressing had halved to one million units per annum since his previous study (Rhys 1972), had fallen by a quarter in powertrain production to 250,000 units per annum, and yet had risen from 200,000 units to 250,000 units per annum in final assembly. Rhys (1999) also suggested a figure of 2 million units per annum to cover the R&D costs. These figures seem to contradict Husan’s view that the MES increases over time, at least with respect to pressing and powertrain, though the MEPS for final assembly does appear to have risen.

The figures from Rhys (1999) would suggest an overall MES for the industry of 2 million units a year, with the manufacturing plants being multiplied as necessary to meet this common denominator. I will now employ survivor analysis in an attempt to reveal the MES for the current automobile industry.

### 3.1 Survivor analysis of the automobile industry

This survivor analysis of the global automobile industry takes the years 1975 to 2005 as the period for investigation, sampling the data at five-year intervals. In taking a three-decade period it is ten years longer than the study conducted by Stigler (1958). The 1975 to 2005 period commences with the coming to global prominence of the Japanese automobile industry, the later rise and consolidation of the Korean industry and, lastly, the recent emergence of the industry in China. All the production figures have been sourced from the OICA, either directly (2000–05) or indirectly (1975–95) from Ward’s Automotive Year Books (1976, 1981, 1986, 1991, 1996). These published figures have originated, in turn, from the national organizations that collect the data. The most recent results have been omitted from the