



FIGURE 5.3. PGM recovered from scrap and secondary materials in the USA, 1975-1992

quota, or the percentage ratio of the amount of old scrap to total industrial demand, in 1992, was: platinum 12,1 per cent, palladium 21,0 per cent, gold 19,3 per cent, and silver 23,4 per cent. In 1955, this ratio for the PGM was 58 per cent. It should be noted that the ratios of trade in PGM derived largely from imports and exports to trade in the unwrought metal in Table 5.1 and 5.2 are respectively 66,82 per cent and 44,05 per cent.

A new factor that may affect the recycling of precious metals in the future is the Basel Convention, which is concerned with the shipment of hazardous materials between various countries. The procedures proposed by the Convention require prior written consent by all parties involved, namely the generating, transit, and receiving countries. The precious metals industries are concerned about the lack of distinction in the Convention between hazardous waste and materials meant for recycling in the first instance, and the costs involved in complying with the statutes of the Convention. Less severe alternatives to the Basel Convention would be the OECD approach, which established three levels of control for shipping materials. A 'green light' would include metals subject to no controls or transport restrictions. An 'amber light' would include some hazardous materials sent only to licenced facilities, with written contracts between sending and receiving parties and notification of the receiving country, which may refuse to accept the materials (these would include precious metals waste) in question. Finally, the metals listed under a 'red light' provision would include all hazardous wastes listed under the Basel Convention.

5.3.3. Refining of Secondary PGM

The smelting and refining of primary or mine-derived PGM, and the world-wide refiners that undertake those processes, have been dealt with above. It should be reiterated, however, that toll refining applies to concentrates from an independent mine (usually one in the process of being developed and/or one that has not developed its own smelting and refining facilities), in which the contained PGM are smelted and refined for a fee and are returned to that mine or owner, without any change in ownership throughout the entire process. The toll, *sensu stricto*, is thus the fee for refining, and is applicable to both primary and secondary metals. The process for the toll refining of waste or scrap materials is the same, except that the refiner may either purchase those materials from, or may toll-refine them on behalf of, the original owner or collector of the scrap or waste. For toll-refining of both the primary or secondary metals, the refiner returns an agreed percentage of the assayed PGM to the supplier as refined-metal shapes (bar, slab, or ingot). Generally, the custom smelter's or refiner's profit is his charge for the service less his costs — although, in many practical cases, any precious or base metals that may be surplus to the amount returnable in terms of the refining contract constitute a bonus for the refiner.

5.4. Strategic Inventories

The PGM are irreplaceable in world industrial usage. It is therefore understandable that consumers and governments (for strategic reasons) will attempt to protect themselves from possible disruptions of future supplies caused by unforeseen problems during production. These can be caused by technical hitches or problems, war or political unrest, industrial action or strikes, and other factors. On the supply side, mining companies may be compelled to hold back their metal production during periods of soft demand, or when dropping prices do not cover their production or refining costs (the Russian and South African stocks have resulted from such a situation). Apart from producer stocks, about which very little is known, there are government-funded inventories which are long-term stocks, while stocks held by importers, refiners, dealers, and consuming industries are essentially short-term stocks.

Long-term governmental stocks, which may be held by any country in the world, are given almost no publicity. However, such stocks are assumed to exist in Japan, Germany, and the UK. Naturally, the cost of creating and maintaining such stockpiles of the PGM is considerable. By contrast, the US strategic government stocks are well publicized — they are held by the General Services Administration (GSA), and were managed in the past by the Federal Preparedness Agency (FPA) on behalf of the GSA. The management structure of the stockpile has now been changed: the Secretary of Defence now also holds the new statutory position of National Defence Stockpile Manager, although some of his duties are now delegated to the Assistant Secretary of Defence for Production and Logistics, who is currently setting up a directorate to take charge of the structure, policy, and planning of the stockpile.

The US stockpile contains some 92 minerals, metals, and other commodities worth some US \$10 billion, although some US \$2 billion, mainly tin and silver, could be disposed of. These are held in 103 locations all over the USA, and are for use in emergencies to cover military, industrial, and civilian needs during three years of hypothetical conventional global war.

The temporal details referring to the amounts of only three PGM held in the GSA stockpile are provided in Figure 5.4 for the period 1950 to 1992. For the first 20 years, the distribution was platinum 54,89 per cent, palladium 43,21 per cent, and iridium 1,90 per cent. A measure of the 'stability' of the GSA inventory for that period shows that the CV for platinum was 25,3 per cent, for palladium 81,8 per cent, and for iridium 38,3 per cent (overall, 30,2 per cent). For the whole 42 years, the composition of the GSA inventory amounted to platinum 34,34 per cent (CV 26,5 per cent), palladium 62,14 per cent (CV 52,5 per cent), and iridium 1,52 per cent (CV 32,2 per cent). The amount of platinum currently held is 13 996 kg (34,6 per cent of the current goal of 40 434 kg), that of palladium 40 434 kg (43,3 per cent of the current goal of 93 310 kg). The current goal