

Reference Pricing: Theory and Evidence¹

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1. Introduction

Reference pricing (RP) refers here to any reimbursement rule used by a third party payer or regulator that sets the maximum reimbursement for one product by reference to the price of some other “comparable” product(s) in the same market. Specifically, reference price reimbursement systems have the following characteristics:

1. products are categorized into subgroups with “similar” therapeutic effects;
2. the reference price is the maximum reimbursement for all products in a subgroup;
3. the reference price is based on some point (minimum, median etc.) in the distribution of manufacturer supply prices;
4. manufacturers remain free to set their prices;
5. if a manufacturer’s price exceeds the reference price, the patient pays the difference.

This form of RP was first formally introduced in Germany in 1989. Other countries that have since adopted some form of RP include The Netherlands (1991), Sweden (1993), Denmark (1993), New Zealand (1993), British Columbia (1995), Australia (1996), Italy (1996), and Spain (2000). In fact, informal reference pricing has existed for many years in generic substitution programs in the United Kingdom, Medicaid and managed care programs in the US, and in some Canadian provincial programs.

“Internal” RP limits reimbursement by comparing product prices within a single country. This is distinct from “external referencing,” which regulates a specific manufacturer’s price in one country by referring to the same manufacturer’s price for the same product in another country. Such external referencing, or cross-national price comparison, is used to regulate new product prices in Canada and Italy, for example, and informally in many other countries. External referencing limits price differentials for a specific manufacturer’s product in different countries, whereas “internal” RP constrains reimbursement for different products by referring to other products within a single market. External RP has important effects (see Danzon 1997 and 1998), but is discussed here only where it interacts with internal RP, formally in The Netherlands and informally in other countries.

Internal RP also is distinct from pure price regulatory systems (for example, France), which limit both the reimbursement and manufacturer’s price. Although pure price regulatory systems often set the price for a new product by referring to prices for existing products, this informal cross-product referencing only compares new drugs to existing drugs at launch, and does not systematically adjust post-launch prices for established products when a new product enters the class. Second, in pure price regulatory schemes the manufacturer is not permitted to charge more than the regulated reimbursement price and has no incentive to charge less. By contrast, most reference price systems regulate the reimbursement price but permit the manufacturer to set a different price, and deviations above and below the reference price do occur, depending on structural features as discussed below. RP has often been adopted in countries that previously permitted free manufacturer pricing and was

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intended to be less controlling than pure price regulation. In practice, certain forms of RP can be *de facto* at least as stringent in controlling prices as pure price regulation, particularly for new products.

This chapter provides a theoretical and empirical analysis of RP. The theoretical analysis in section 2 evaluates RP as a reimbursement rule for a social insurance system, using criteria of efficiency and equity. Section 3 describes the basic structural features of any reference price system and shows how specific choices are likely to affect outcomes. Sections 4, 5 and 6, respectively, provide specific detail on three prototypical reference price systems -- Germany, The Netherlands and New Zealand. We report available evidence on effects of RP in each country on prices, physician prescribing and total drug expenditures. We emphasize that such aggregate data are at most suggestive due to confounding factors. Countries that have adopted RP also have adopted other cost control strategies; moreover, aggregate trends reflect the underlying market evolution, including the launch of new products, aging of older products and increased generic competition. Ideally, one should compare the actual experience with RP against the unobserved counterfactual, that is, what would have occurred with other changes but no RP. This would require either a randomized controlled trial or natural experiment, but no such evidence exists. Most of the reported estimates simply report trends, without controls for other regulatory and market factors. Any causal inferences about the net effects of RP therefore are tentative.

2. Economic Rationale and Criteria for Evaluating RP

RP is a reimbursement rule used by public and private insurance systems. It should therefore be evaluated using principles of efficiency and equity in insurance design. Proponents also argue that it is a mechanism for promoting competition, setting reimbursement at efficient price levels, while permitting patients to pay more if they choose. These rationales are discussed in turn.

2.1 Efficient Insurance Design

Most theoretical analyses of optimal insurance coverage under imperfect information (see, for example, Pauly 1968, Zeckhauser 1971, Ellis and McGuire 1991) focus on the design of patient and provider cost sharing to achieve the optimal trade-off between financial protection for patients and constraint on moral hazard. The implicit assumption is that the supply of insured goods and services is perfectly elastic at a price equal to marginal cost, and that marginal cost pricing provides optimal reimbursement for suppliers.²

For pharmaceuticals, however, a reimbursement rule that attempts to mimic competitive markets, setting price equal to short run marginal cost, is not (second best) optimal because it would not pay for R&D (Danzon 1997a). For research-based medicines, R&D is roughly 30 percent of total cost. Marginal cost of production is roughly 25 percent of total cost or less, depending on what costs are included.³ Although marginal cost pricing would suffice for continued supply of existing medicines, it would be inadequate to provide incentives to develop new medicines. Thus in evaluating RP as a reimbursement rule for medicines, efficiency requires considering not only the usual trade-off between cost control and access for patients, but also setting prices that create appropriate incentives for R&D to develop future medicines.

2.2 RP as a Surrogate for Market Competition

RP is sometimes rationalized as a strategy to promote competition and hence base reimbursement on a “competitive” price level. The argument is that competition between drugs is weak because patients and physicians are uninformed and/or insensitive to prices, due to insurance. By paying a common

² An exception is Wedig (1993), who shows how physician fees affect the supply of medical services.

³ These estimates refer to percentage of total costs, discounted to present value at launch (Danzon 1997a).

reimbursement price for products that are “close substitutes,” with the patient liable for any excess, RP creates incentives for prescribers and patients to be price sensitive. In theory, a manufacturer with a superior product can charge more than the reference price if patients are willing to pay for the incremental quality. The regulator thus avoids the impossible task of trying to base prices on some measure of appropriate costs, as in some price regulatory systems.⁴ A reference price that is based on a low-price manufacturer’s supply price is assumed to cover the cost of an efficient supplier.

This view of RP as a strategy to promote competition begs the question of the appropriate degree of competition. In the case of pharmaceuticals, competition to drive prices down to marginal cost is not appropriate, because marginal cost pricing would not pay for R&D, as argued above.

The appropriate extent of competition depends on patent status. The purpose of patents for research-based products is to bar competition from generically equivalent products for the duration of the patent. This restriction on competition from identical products is intended to permit the innovator firm to set prices above marginal cost and hence potentially recoup the cost of R&D, depending on competition from close but imperfect substitute products. The optimal extent of competition while a product is on patent, the optimal length of patent life and the optimal level of R&D are interdependent, complex policy issues that are beyond the scope of this paper. Here we take the current patent system as given. We simply assume that patents are intended to protect innovator products for the life of the patent from competition that reduces prices to marginal cost. However, after patent expiration, the standard economic case for unrestricted competition and marginal cost pricing applies equally to medicines.⁵

This analysis implies that RP applied to off-patent, multisource compounds -- hereafter “generic referencing” -- is potentially consistent with efficient insurance design, including efficient incentives for R&D. Restricting RP to off-patent compounds preserves patent protection and hence incentives for innovation, but creates potential savings from competition once the patent has expired. Moreover, since generics are required by registration to be (virtually) bioequivalent to the originator, a reimbursement rule that treats post-patent generically equivalent products as perfect substitutes permits budget savings with no significant threat to health for the great majority of patients. Note that this rationale for generic referencing applied to off-patent products does not apply to parallel imports while the innovator product is on-patent, because parallel imports are competitive sources of the identical compound. Applying RP to parallel imports undermines the innovator firm’s ability to maintain cross-national price differences, whereas Ramsey pricing principles imply that price differences that are inversely related to demand elasticity are the (second-best) optimal way to finance the joint costs of R&D (Danzon 1997a).

⁴ Cost-based regulation in general is flawed, because accounting costs do not reflect economic costs and because a rule that sets prices to cover all costs cannot create incentives for the efficient level of costs. Such rules applied to medicines are further confounded because any allocation of the joint costs of R&D across countries, based on transfer pricing or other accounting rules, is arbitrary (Danzon 1997a).

⁵ Even if profits while on patent are insufficient to encourage the socially desired level of R&D, this is better addressed by increasing price levels during the on-patent phase than restricting post-patent competition. The incentives for R&D depend on the discounted present value of expected lifetime revenue for a compound at the time of the R&D investment. A given percentage price increase has a greater effect on this discounted present value, the earlier the price increase occurs. Thus restricting competition has a more powerful incentive effect on R&D if done before rather than after patent expiration (Danzon 1998b). For simulated effects, see Grabowski and Vernon (1996).

RP applied to different compounds with different therapeutic effects or side effects -- hereafter “therapeutic referencing” -- is potentially inefficient both for providing appropriate financial protection to patients and for incentives for R&D. Consider first the effects on prescribing choices between different drugs. Assume that the RP system sets a common RP for two compounds, A and B, although A has adverse side effects for some patients. If the manufacturer of B maintains a price above the RP, those patients who cannot tolerate drug A face a surcharge. Since different compounds affect patient subgroups differently, due to genetics, commorbidities, other medications they are taking, etc., RP results in arbitrary surcharges on patients, depending on risk for adverse interactions. Such arbitrary and open-ended surcharges are inconsistent with efficient insurance protection and may fall most on the sickest patients.

Therapeutic referencing of different compounds is potentially inefficient even if patient heterogeneity reflects subjective preferences rather than objective, clinical differences. Therapeutic referencing does not *ipso facto* create a competitive market in which patients are fully informed about the risks and benefits of different drugs, given their circumstances. The patient, if fully informed, might be willing to pay a surcharge for a product with lower risk of side effects, for example. But educating patients takes time, for which physicians typically are not reimbursed. If physicians do not take the time to explain to patients, then although in theory patients could express their willingness to pay for higher quality by paying surcharges, in practice they may lack the necessary information. Moreover, if adverse effects are only discovered by the trial and error of switching drugs, this may entail costs in medical resources and patient well-being. If so, reference price systems distort the role of prices as an indicator of value to consumers and an incentive to producers.

The potentially adverse effects of therapeutic RP on incentives for R&D are greatest if new, on-patent products are clustered with older, off-patent products, including generics. In that case, the RP is likely to be set at the price of a generic, which may approximate the marginal production cost. Reimbursement at marginal cost is appropriate for generics, which incur virtually no cost of R&D. However, reimbursement of on-patent, innovator drugs at marginal production cost undermines the manufacturer’s ability to recoup the costs of R&D, hence negates the intent of patents and undermines incentives for product improvement or innovation. Thus therapeutic RP applied to drugs that differ in effectiveness or side effects is inconsistent with sound insurance design, particularly if on-patent products are included.

Proponents of such RP argue that the new products are only grouped with the old products when there is no material difference in effects, in which case there little if any social value in rewarding the R&D. However, classification decisions in reference price systems are generally made without rigorous cost-effectiveness analysis. Moreover, because patients differ in their responses to drugs, what is a trivial difference for one patient may be a significant difference for another.

2.3 RP as Efficient and Equitable Social Insurance

RP applied to off-patent, multisource compounds could be considered consistent with efficient and equitable use of public funds. This view holds that publicly funded or mandated insurance appropriately covers basic care for all citizens, leaving those who want more extensive or higher quality care to pay for these additional services out-of-pocket, without public subsidy. Consistent with this, many public systems pay for a ward or a semi-private room in a hospital, leaving those who want a private room to pay the excess themselves.

The analog for pharmaceuticals is a generic RP system applied to off-patent, generically equivalent drugs, that pays the cost of a low priced, usually generic version, leaving patients who want a more expensive brand to pay the difference themselves. Generically equivalent products are bioequivalent

for the great majority of patients. Thus generic referencing applied to multisource, off-patent compounds is consistent with this notion of efficient and equitable social insurance.

By contrast, therapeutic RP, which clusters distinct compounds that differ in effectiveness or side effects, provides different levels of insurance for different patients, depending on their ability to tolerate the products that are priced at the reference price. Such therapeutic referencing is inequitable to patients who need higher priced products to achieve an equivalent therapeutic effect. Elderly patients with comorbidities are likely to be disproportionately adversely affected.

2.4 Trade-offs between Effects on Patients and Effects on R&D

Since RP sets the reimbursement level but not the final price, the effect on patients depends on how manufacturers respond. If a manufacturer of a superior product maintains its price above the reference price, the patient must either pay the excess or face the health risk of switching to a different, cheaper product that is priced at the reference price. Alternatively, if the manufacturer drops the price to the reference price, current patients face no out-of-pocket cost or health risks, but manufacturers face reduced incentives for R&D because the superior product receives no premium. Thus manufacturers' pricing response determines the extent to which the effect of the RP system falls on patients, through out-of-pocket costs or health risks, or initially on manufacturers, through reduced incentives for innovation, and ultimately on future patients due to fewer new drugs. As discussed further below, manufacturers' price response depends in part on the design of the reference price system.

2.5 Private Insurance and RP

In some countries, private insurance covers excess charges on reference priced products. For example, some private insurance plans in British Columbia cover excess charges on drugs, whereas in Australia and New Zealand private insurers generally do not. In general, using private, supplementary insurance to pay for co-payments in public plans is inefficient if the public plan has designed its co-payments as a reasonable constraint on moral hazard. Such "gap" insurance may also be inequitable, since those who have supplementary insurance to cover public system co-payments tend to increase their use of public services, compared to those without supplementary insurance. The implication is that RP in public systems should be designed assuming that private supplementary insurance is not available to cover patient cost-sharing.

2.6 Does "Industrial Policy" Correct the Distortions in RP?

Policy debate over pharmaceutical reimbursement sometimes recognizes an industrial policy objective to be balanced against the fiscal goal of controlling drug expenditures. However, the usual industrial policy debate focuses on how country A's prices affect current employment and investment in country A, ignoring effects on returns to R&D investments incurred in other countries, even though patients in country A benefit from the foreign R&D. The basic problem is that pharmaceutical R&D is a global, joint cost that serves patients worldwide. A country-specific framework for industrial policy therefore encourages countries to ignore the effects of their reimbursement policies on R&D that is located abroad. Thus a reimbursement rule can be consistent with a specific country's national industrial policy goals but suboptimal from a global perspective, because of free-riding on the others to pay for the common R&D (Danzon 1997a).

3. The Structure of Reference Price Systems

Any reference price system requires several key structural decisions: criteria for grouping drugs; criteria for setting and updating reference prices; and incentives for patients, doctors and pharmacists. Decisions on each of these dimensions involve a trade-off between low current prices, on the one

hand, and incomplete protection for patients and/or undermining of incentives for innovation, on the other.

3.1 Criteria for Defining Groups

Product groups may be defined based on similarity of chemical composition, clinical indication, therapeutic action or some combination of these criteria.

Generic Substitutes The narrowest definition restricts clustering to products with the same active ingredient. Although generic equivalence does not guarantee therapeutic equivalence for all patients, the differences are small enough that many public and private insurers apply this approach to reimbursement for multisource compounds, without necessarily calling it RP. Such generic reference price systems include: Phase I in Germany; Sweden, which requires the same dosage form and strength as well as active ingredient; and generic substitution in the United Kingdom, some Canadian provinces, and U.S. managed care and Medicaid programs. Rapid generic penetration under such generic substitution programs confirms that few patients are willing to pay more for the originator brand. For example, generics often capture over 60 percent of the market within six months of the originator's patent expiration in the US. As discussed above, generic RP applied to multisource, off-patent products is consistent with sound insurance design, poses little health risk to patients and preserves incentives for R&D. This is not true, however, if RP is applied to include parallel imports while the originator is still on-patent, as discussed above.

Therapeutic Substitutes Therapeutic referencing assigns different compounds to a single group if they have the same mode of action, treat the same indication or have similar therapeutic effect. The broader the clusters, the greater the potential savings to payers but the greater the real therapeutic differences between compounds in a single cluster and hence risks to patients. Variance in therapeutic effects within clusters implies either financial exposure for patients, if they do not switch to a drug priced at or below the reference price, or health risks if they switch to a cheaper but less appropriate product. Advice of local medical experts is usually one input into defining such therapeutic groupings but political judgment is also inevitable in deciding what costs are to be paid by the insurance scheme and what costs are shifted to patients.

On-Patent vs. Off-Patent Products The decision whether to include on-patent products and to cluster on-patent products with off-patent products raises a critical trade-off between cost control and incentives for R&D, in addition to the issues of therapeutic substitutability. Clustering patent-protected products with off-patent generics implies setting a reference price that is either inappropriately high for the generics, if the RP exceeds marginal production cost, or inappropriately low for the on-patent product, if the RP is set by the supply price of generics, hence approximates marginal cost. The conflict is greater, the broader the clusters. Systems that define clusters based on clinical indication or therapeutic effect tend to automatically group on-patent products with off-patent products. Germany expressly exempted new patented products from the RP system after 1996.

3.2 Setting the Reference Price

Minimum, Mean or Median? The reference price is set at some point in the distribution of manufacturer prices – the minimum in New Zealand, initially the average in The Netherlands. The lower the point in the distribution, the more adverse the effects on patients and/or on R&D if on-patent products are grouped with off-patent products. Whether use of the unweighted or volume-weighted price distribution results in a lower RP depends on the number of products and their market shares. For example, if the group consists of a single, high priced brand with large market share and several lower-priced generics with small market shares, setting the RP at the unweighted average price will result in a lower RP than a weighted average price, depending on market shares.

Use of DDDs to Compare Prices Across Products Therapeutic reference systems that group different compounds must define common units for the different compounds to which the common RP applies – essentially an apples-and-oranges problem. The Netherlands compares products based on a “standard daily dose,” a modified form of the WHO ATC defined daily dose (DDD) system. The WHO DDDs are defined taking into account several criteria, including actual practice and recommended practice. Similarity of effect (equipotency) may be considered but is not required, and differences in duration of treatment to achieve desired effects are ignored.

Since the WHO DDD system was explicitly *not* designed to be used for reimbursement, using it to set reference prices can result in inappropriate price signals to consumers and producers (Danzon 1996). Price signals are appropriate if products with a common price are equivalent in all relevant dimensions -- efficacy, treatment duration and side effects. For example, consider two drugs A and B to treat the same condition. To achieve a given probability of cure, drug A requires a daily dose of 200mg for eight weeks, whereas drug B requires 400mg per day for four weeks. If both A and B are reimbursed at the same price per DDD, that is, 200mg for A and 400mg for B, prescribers have no price incentive to prefer B over A, yet A costs payers twice as much as B for the total course of treatment. Moreover, patients would prefer B, due to its shorter treatment duration, but the manufacturer of B receives only half the revenue received by A’s manufacturer. Appropriate price signaling requires that A’s price per DDD should be at most half of B’s price per DDD – less if noncompliance reduces the effectiveness of A compared to B.⁶

Thus therapeutic referencing that clusters different compounds begs the issue of defining the dosages that are presumed to have the same effect and hence receive the common reference price. To achieve appropriate economic incentives for prescribing and for future R&D, a common price should be applied only to equipotent units, taking into account differences in duration of treatment and – if equipotency is only approximate – differences in side effects. Application of existing DDD systems that were created for other purposes will lead to inappropriate relative prices, which distorts incentives for cost-effective prescribing decisions.

Frequency of Revisions For therapeutic RP, changing the reference price entails administrative costs to payers; time costs for physicians of remaining informed; financial and health costs to patients if the change in the reference price leads to a change in their medication, possibly with side effects, confusion and noncompliance, which may add to use of other medical services. These costs are particularly significant for the elderly on chronic medications. Frequent and unpredictable price changes are also costly for manufacturers, whose pricing and supply may need to change abruptly if reference prices change. For generic RP, frequent changes in the RP can increase savings for payers without significant costs to patients or physicians, since no prescribing changes are required.

3.4 Information and Incentives to Physicians

The prescribing decisions of physicians and pricing strategies of manufacturers in response to RP are interdependent. Physicians may face competitive pressures, professional norms or a legal obligation (in Germany) to explain to the patient if they prescribe a product that entails a surcharge. The monetary value of this implicit time cost to physicians could easily exceed the out-of-pocket surcharge to patients. Both tend to make demand highly elastic at prices above the RP.

⁶ Danzon (1996) discusses necessary modifications of the DDD system if it is to be used for pricing.

In addition, physicians may be subject to budgets or prescription audits to discourage use of relatively high priced drugs. Where physician audits or drug budgets – indicative or explicit -- are superimposed on RP, as in Germany after 1993, the financial incentives for physicians under drug budgets reinforce the RP incentive effects for physicians to choose drugs priced at or below the RP.⁷

3.5 Authority and Incentives of Pharmacists

Manufacturers' incentives to price below the reference price depend critically on the authority and incentives of pharmacists, in particular, their ability to substitute between generically equivalent products and to profit from such substitution. Countries differ in their authorization of generic substitution and incentive structures for pharmacists.⁸ For example, in generic substitution programs in the United Kingdom and U.S. managed care, pharmacists keep the difference between the reimbursement (reference) price and acquisition cost of a cheaper generic. Price elastic demand on the part of pharmacists creates incentives for manufacturers to cut price below the reference price to gain market share. In the United Kingdom and United States, payers take advantage of this to reduce the reimbursement price from time to time. The United Kingdom also "claws back" some of the extra margin earned by pharmacists. Such a clawback is unnecessary under managed care which typically pays a fixed dispensing fee, not percentage of the price. Ironically, although RP is intended to encourage competition, several countries with RP systems lack the competitive structure and reimbursement arrangements for retail pharmacy that are necessary for payers to realize these savings from RP on off-patent medicines. More on this below.

3.6 Manufacturer Response

Manufacturers' response to RP depends on the demand elasticity for their product, which in turn depends on the price sensitivity of decision makers -- physicians, patients and pharmacists -- and possibly on reactions of other competitors in the market. Since RP is applied primarily to therapeutic categories with multiple producers, a reasonable assumption is that a reference priced group is monopolistically competitive. Products are close but imperfect substitutes, and manufacturers set their prices independently, taking other firms' prices as given.⁹ If physicians are reluctant to prescribe a product that entails a significant time cost to themselves and/or a surcharge to the patient, this tends to make demand highly elastic at prices above the reference price. In that case, a manufacturer's best strategy is to drop price to the reference price, even for superior products, in order to preserve market share. Conversely, physicians (and patients) are indifferent to prices below the reference price, in the absence of a prescribing budget or other controls outside the reference system, implying inelastic demand below the reference price, hence no incentive to lower price. Thus, considering only effects on incentives of physicians and patients, RP implies a demand curve for the manufacturer that is kinked at the reference price (Danzon and Liu 1996). The manufacturer's best response is to set price at the reference price, which generally means a price cut for originator products, whereas generics that were priced below the RP may raise their prices to the RP.

Several factors may modify this conclusion. First, the less substitutable are products in the cluster, the less willing patients and physicians will be to switch to a reference-priced product, implying less elastic demand at prices above the reference price. Thus the broader the cluster, the less likely it is that all manufacturers will drop their prices to the reference price. Second, for generically equivalent products, if pharmacists can substitute and profit from dispensing cheaper products, their demand is

⁷ See Danzon and Liu (1996) for theoretical and empirical analysis of RP and physician drug budgets in Germany.

⁸ Therapeutic substitution by pharmacists between different compounds has been debated, for example in Denmark, but so far is not permitted.

⁹ Zweifel and Crivelli (1997) use a duopoly model but do not explain how the implied collusion between generics occurs.

price elastic below the reference price, which creates incentives for manufacturers to price below the reference price to gain market share. Similarly, if physicians have incentives to be price sensitive due to prescription audits or drug budgets, manufacturers have incentives to set prices below the reference price to gain market share. This applies to both generic and therapeutic substitutes.

Third, the kinked demand model assumes that a manufacturer views each country as a separate market. If in practice markets are interrelated, due to informal or formal external referencing, the manufacturer's best pricing strategy in the market with RP depends on cross-market effects in all interrelated markets. Thus manufacturers may maintain prices above the RP, despite loss of market share in this market, in order to avoid spillover price effects to other markets where higher prices can be achieved. For example, manufacturers' pricing decisions in response to RP in British Columbia are likely to take into account effects on prices in other Canadian provinces and possibly in the United States. Similarly, pricing response to RP in The Netherlands may reflect expected spillover effects to other related EU markets, if The Netherlands RP is relatively low, or the risk of inducing parallel imports, if The Netherlands RP is relatively high.

3.7 Admitting and Pricing New Drugs

New drugs are a major factor in expenditure growth in most countries. How an RP system handles new drugs, then, significantly affects expenditure growth and access for patients. Some countries, such as The Netherlands and New Zealand, in principle include new products in reference price systems, but with strict conditions attached to admission, as discussed below. In countries that exclude new patented products from RP, such as Germany post-1995, the United Kingdom and the United States, new product prices and volume may be affected nevertheless by RP, depending on cross-price demand elasticities, relative time costs to physicians, and pricing and promotion incentives of manufacturers.

In theory, there seems no reason for payers to deny access to reimbursement for new products that agree to accept the reference price in an established cluster – indeed, if RP increases competition, this should reduce prices. In fact, New Zealand requires that the manufacturer of a new product offer a significant price cut relative to the RP in either this or another category.¹⁰

4. Germany

4.1 Background and Cost Control Initiatives

Germany's social insurance scheme based on sickness funds provides universal coverage for a broad range of prescription and some OTC products.¹¹ Manufacturers were traditionally free to set prices that were reimbursed and patients faced minimal co-payment.¹² A voluntary price freeze slowed the rate of growth of prices in the mid 1980s, but total expenditure continued to increase due primarily to shifts to newer, more expensive products. A reference price (*festbetrag*) system was introduced in 1989 and phased in over several years. Although RP did reduce prices of reference priced compounds, total expenditure continued to increase on average.

In 1993 Germany's Health Reform Law added a national, global spending limit for outpatient medicines, with physicians at risk for the first DM280m of any overrun, and the pharmaceutical industry at risk for the next DM280m. In addition, a price cut of 5 percent and a three-year price

¹⁰ Italy requires that a product accept the reference price or be delisted entirely from reimbursement.

¹¹ This includes 21,000 approved products and 23,000 older products not yet reviewed for effectiveness (PPR, Nov. 1998)

¹² The German market included over 145,000 pharmaceutical products in 1978, reduced to about 50,000 in 1993 due to tighter controls on market authorization (Ulrich and Wille 1996).

freeze were imposed on non-reference priced drugs. Patient co-payments were increased to DM 3, 5 or 7 and applied to all products, including those under RP.

In March 1997, faced with challenge of allocating budget overruns among physicians, the German government announced that global prescribing budgets would be replaced by physician-specific prescribing guidelines and drug budgets, based on medical specialty and patient mix. Implementation has been slow, partly reflecting the significant data requirements and obstacles to data sharing between the various institutions involved. Patient co-payments were further increased in 1997. Although these other controls are not the subject of this study, they have no doubt influenced effects of RP and thus must be taken into account in interpreting the German experience with RP.

4.2 Classification

Consistent with the corporatist principles of the German sickness fund system, the federal government defines broad parameters but implementation is left to the Association of Sickness Funds (Bundesverband der Betriebskrankenkassen, or BKK) and the Association of Doctors. In particular, the BKK defines the classification system, subject to the approval of the physicians. Three criteria are used as the basis for product groupings:

- Phase 1: Products with the same active ingredient
- Phase 2: Therapeutically and pharmacologically similar active ingredients
- Phase 3: Compounds with comparable therapeutic effect, especially combinations

Litigation over the definition of groups, particularly the clustering of newer, patented products with off-patent molecules, slowed the implementation of phases 2 and 3. Following legislation, new patented products launched after January 1, 1996 were exempt from RP for the duration of the patent, but patented products that had already been included remained in. Thus new patented products are admitted to reimbursement without price controls, whereas new forms of off-patent products are free to join existing clusters.

As of January 2000, reference prices covered 197 active ingredients in class 1, 166 active ingredients in 23 groups in Class 2, and 31 combinations in Class 3. These drugs accounted for roughly 50.3 percent of expenditures and 64 percent of scripts under the statutory health system (VFA 2000).

4.3 Setting the reference price

Traditionally, the BKK has set the reference price levels. In 1999 the pharmaceutical industry challenged the legitimacy of the BKK setting the RP levels, as a violation of German and EU competition law. In response, the government moved jurisdiction for suits over reference prices from the civil courts to the courts of social affairs, and proposed legislation that would establish a government agency to implement the reference prices, based on recommendations from the BKK. These issues remain to be fully resolved. This section describes the system as it existed from 1989 to 1999.

The German method for setting reference price levels and package size differentials has been less rigid and more adaptive to market conditions. The reference price (RP) for a standard pack/strength was set within the range of manufacturer prices, with a higher RP granted in subgroups with few generic suppliers in order to encourage further entry. A quasi-hedonic regression equation (of Cobb Douglas form) was applied to manufacturer price levels and the estimated coefficients are used to set relative RPs for different strengths and package sizes. Although criticized as less transparent than alternative methods, such as The Netherlands' DDD system, the regression methodology is in principle more reflective of market price differences.

RP levels are updated, initially every two years but now every year, based on a review of actual manufacturer prices. Review led to consolidation of clusters and reduction in RP levels, in classes where the prevailing RP exceeded the average retail price by more than 2.5 percent (PPR 1997).

4.4 Physicians

A physician who prescribes a product that is priced above the reference price is legally required to explain to the patient why the higher priced product is necessary. Since the average duration of a physician visit is very short in Germany and spending additional time is not reimbursed, the opportunity cost of such explanations creates incentives for physicians to prefer products priced at or below the RP. After 1993, physician price sensitivity was reinforced by the drug budgets.

4.5. Pharmacists

Retail pharmacy in Germany is extensively regulated. Every pharmacy must be owned and operated by a pharmacist and branch ownership is not permitted; pharmacies have a monopoly on the sale of prescription and some other medicines; pharmacies may only sell a limited range of other goods, such that medicines account for 93 percent of turnover. Pharmacists' dispensing fees are regulated as a declining percentage of the purchase price, averaging 27.3 percent (VFA, 2000). The wholesale percentage is also regulated (averaging 4.1percent), but is partially passed on to pharmacists through competitive discounting to gain market share. Retail price competition is not permitted. This reimbursement system creates incentives for pharmacists and wholesalers to prefer more expensive to less expensive products.

4.6 Effects of RP

Identifying the effects of RP from simple trends in aggregate data is problematic because of the other cost control strategies and ongoing changes in product mix (which may itself be influenced by regulatory constraints). Danzon and Liu (1996) use multivariate analysis applied to product-level data to attempt to identify the net effects of RP, controlling for effects of market changes and the 1993 reforms, to the extent possible.

Physician Prescribing Patterns Survey data on prescribing patterns of general practitioners in response to the 1993 drug budgets and co-payment (Himmel et al. 1997) are suggestive of the likely effects of RP. About two-thirds of physicians reported changing their prescribing patterns because of the law (former East Germany, 60.4 percent; former West Germany, 73 percent). Of the West German respondents, 52.3 percent said that they used generic drugs more often (29.5 percent in the East), and 72.8 percent were less liberal in meeting patients' wishes (61.0 percent in the East). Among criteria for drug selection, 70.3 percent rated patient cost as unimportant (43.4 percent for the East), whereas only 18.2 percent rated total cost as unimportant. Clinical factors (bioavailability, efficacy, side effects, patient compliance) were rated as important or very important by over 95 percent (Himmel et al. 1997). These findings suggest that physicians base prescribing decisions more on clinical factors and their own costs than on out-of-pocket costs for patients.

Effect on Prices and Manufacturer Revenues

The effect of the RP system on drug prices in Germany is consistent with the kinked demand model. Anecdotal evidence is that virtually all brand manufacturers dropped their prices to the reference price to reduce loss of market share (Remit 1991), which is consistent with a kinked demand model with highly elastic demand at prices above the RP. As of 1998, 97 percent of prescriptions had no cost sharing other than the statutory co-payment (PPR, Nov. 1998).

Conversely, some lower priced products either maintained or even raised their prices, consistent with inelastic demand below the reference price. Nevertheless, for multisource compounds, during 1989-

1994 the weighted average molecule price (averaged over both brand and generic products in each molecule) fell compared to non-reference priced products, after controlling for drug budgets, molecule age and number of competitors (Danzon and Liu 1996). VFA (2000) reports that, between 1992 and 1999, prices of referenced priced products fell 14 percent, while prices of products outside the RP system rose 6 percent and the cost of living increased 13 percent.

Despite the decline in brand prices relative to generics, generics gained share of volume at the expense of brands, suggesting that physicians switched to generics to avoid the risk of an explanation requirement, even though in fact most brand prices had dropped to the reference price.¹³ Thus the net effect of the RP system has been to shift revenue to generics at the expense of originator products, due to both price and volume effects. Ulrich and Wille (1996) report that between 1989 and 1992, generic share of scripts for multisource compounds increased 10.9 percent (from 53.2 percent to 58.3 percent), whereas generics' share of sales increased 14.9 percent (from 42.2 percent to 48.5 percent), consistent with a generic gain in volume share despite higher relative prices. The 1993 drug budgets had qualitatively similar but quantitatively greater effects on generic shares, hence these changes in generic shares cannot be attributed solely to RP.

Total expenditures Although the RP system reduced prices for RP products, total expenditure continued to rise initially. This is not surprising because for the phase 1 products, generics already accounted for over 50 percent of scripts in 1989. Thus the potential phase I savings from reducing brand prices and volume was small. More recent evidence confirms that RP has continued to slow price growth for RP products, offsetting the increase in non-RP product prices to yield essential flat nominal prices and declining real prices, adjusted for inflation. Thus by reducing prices in the off-patent sector, RP has contributed budgetary "headroom" for newer, more expensive products.

In general, RP cannot be expected to control expenditures because it has no direct effect on volume and structural shift, the main driver of pharmaceutical expenditures in Germany (see table 4.1). In fact, until the 1993 drug budgets, RP may have increased volume because RP drugs were exempt from the DM3 co-payment. RP also may have encouraged switching to non-referenced products, which entailed no risk of explanation requirements for doctors or excess charges for patients. Moreover, a simple economic model of life-cycle pricing predicts that manufacturers will rationally increase price towards the end of the non-reference phase of the life cycle in response to the shorter economic life implied by RP (Danzon and Liu 1996).¹⁴ Consistent with this, data on the components of expenditure growth in table 1 show an increase in the interdrug effect (switching to more expensive products) in 1991- 1992, compared to 1987-1990. This interdrug effect became negative in 1993, when physicians faced financial risk under the drug budgets.

The VFA (2000) reports total saving from RP at DM 3.1b in 1999, or roughly 19.7 percent of retail pharmacy sales at ex-factory prices. If this savings estimate is calculated as the difference between pre-RP and post-RP prices and volumes for products under the RP system, it may overstate the savings attributable to RP, for several reasons. First, some decline in brand prices and gain in generic market share would likely occur after patent expiration under competitive market pressures, regardless of RP. Second, the estimate would omit any contribution of RP to price and volume increases for non-reference priced products. Third, it ignores the physician drug budgets and patient

¹³ See also Giuliani et al. (1998). In some regions physicians' preference for generics may have been reinforced by indicative budgets used by some sickness funds, even prior to the formal 1993 drug budgets.

¹⁴ Frank and Salkever (1993), using a single period, market segmentation model, predict a brand price increase after patent expiration in response to generic competition. A life-cycle pricing model yields the same result prior to patent expiration.

co-payment changes that have no doubt also contributed to cost-consciousness of physicians patients and patients.

In contrast to RP, the 1993 drug budgets and price cuts led to an immediate and significant reduction in drug expenditures. Sales of reimbursed products fell 14.5 percent in 1993, compared to 1992. Drug spending also declined as a percent of total health care spending, from 16.1 to 13.1 percent (Ulrich and Wille 1996). Since 1994, drug expenditures have grown modestly, due primarily to structural change, while price and volume change remain negligible.

4.7 Conclusion

The evidence from Germany clearly shows that RP has reduced the average price per molecule for RP drugs, primarily because originator brand prices are reduced to the reference price to minimize the loss of market share. Originator brand products have lost revenue to generics because of loss of volume share despite the decline in brand prices relative to generic prices. The fact that generics gained volume despite an increase in relative price is inconsistent with simple economic models and suggests that physician prescribing was influenced by time costs and possible informal indicative budgets in some regions. RP did not control the growth in aggregate drug spending -- not surprisingly, because it is not designed to reduce volume or structural shift. However, over time it has generated significant savings in prices in the off-patent sector, which in turn has freed up budgetary room for higher priced new products.

5. The Netherlands

5.1 Background and Cost Control Strategies

Until 1996, the Dutch social insurance system provided universal coverage of outpatient drugs. Since 1996, about 60 percent of the population (those with income below an indexed threshold level) have mandatory coverage through sickness funds. The remainder of the population is covered by private insurance. Since the government strives to maintain similar benefit packages and premiums between the private and public insurers (de Vos 1996), the same regulatory systems, including RP, apply. Private insurance does not cover out-of-pocket excess charges above reference prices. Patients are traditionally not accustomed to paying co-payments on medical services. A small co-payment per prescription (NG2.5, roughly US\$1.50) was introduced in 1983 but was highly unpopular and eliminated in 1990. There is a NG200 per annum deductible that applies to both physician visits and outpatient drugs; thereafter co-payment is zero.

The Netherlands traditionally has had relatively low per capita pharmaceutical consumption due to both relatively few physician visits and few prescriptions per visit. However, Dutch prices were among the highest in Europe – three times the level in France (Rigter, 1994). Although the precise measure of price differentials is no doubt sensitive to the sample, time period and methods used (Danzon and Kim 1998), the fact that The Netherlands has been a target for parallel imports confirms significant price differentials relative to at least some European countries. Wholesalers' margins were 18.6 percent, the second highest of 13 European countries. Overall, per capita expenditure on pharmaceuticals was the second lowest of eight major European countries in 1992. Nevertheless, the rapid growth of pharmaceutical spending relative to other medical services in the 1980s and political pressures made pharmaceuticals a target for cost control (Rigter 1994).

In 1988 a proposal to establish RP was forestalled by adoption of a system of self-regulation, including the pharmaceutical industry, pharmacists, wholesalers and insurance companies. Other measures to reduce drug costs included: a fixed dispensing fee in place of a percentage margin for pharmacists, to remove the financial incentive to dispense high priced medications; incentives for substitution of generics and parallel imports, by allowing the pharmacist to keep one third of the price

differential between the official brand price and the price of a generic or parallel import; a “negative list” of non reimbursed drugs; and, to a limited extent, the government has encouraged development of guidelines and formularies (Rigter 1994).

In 1991 a reference price system of reimbursement was introduced, operated by the Ministry of Health, and extending the German system in several ways, as discussed below. One stated rationale for the RP system was to improve information, hence cost-consciousness and competition: “. . . considerable effort was expended by the Dutch government to stimulate price competition in the pharmaceutical market. . . . only when the necessary information about a specific medicine in relation to its substitutes is readily available can the demand side of the market, i.e. consumers, doctors, patients and insurance companies, make decisions on the fairness of prices. In The Netherlands, this objective was achieved by categorizing medicines into groups of interchangeable drugs and making doctors and patients aware of the interchangeability of medicines within such groups” (De Vos 1996).

In 1993 additional spending controls were adopted, including:

- A formal positive list of products eligible for reimbursement, but possibly subject to additional prescribing guidelines;
- Restricting access of new drugs to reimbursement unless they provide a remedy for diseases for which there is no existing therapy, or joined an established cluster;
- A fixed tariff for pharmacists;
- Reduction of the wholesale margin from 18.6 to 12 percent, to discourage discounting to pharmacists;
- Less strict definition of “interchangeable” drugs, hence broader classes.

In 1994, in response to a threat by the government of a 15 percent reduction in reference prices, the industry agreed to a price cut averaging 5 percent. In June 1996, the Price Regulation Law superimposed pure price regulation on top of the reference price reimbursement system, by setting maximum prices for all products, based on average prices in Belgium, France, Germany and the United Kingdom. Since 1997, some non-reimbursed products have been admitted to reimbursement if they meet a rough cost-effectiveness criterion.

5.2 Classification of Reference-Priced Products (List 1a)

Different compounds are clustered together with a single RP, without regard to patent status, if all of the following criteria are met:¹⁵

- same mechanism of action;
- used for the same indication, based on actual use, not the official product labeling;¹⁶
- similar route of administration -- for example, parenteral forms are grouped separately from oral forms of the same compound (transdermal forms are included with oral, mucosal forms are with parenteral);
- intended for the same age group (this criterion is rarely used);
- no significant differences in clinical effects. This includes desirable or undesirable properties, and must apply to *all* patients, whereas an earlier definition that did not require that

¹⁵ There are proposals to reduce these five criteria to one or two, based on clinically relevant differences in effects.

¹⁶ For example, different strengths of estrogen are grouped together although they are labeled for different indications. This may be inevitable if users can arbitrage any price differentials by varying the number of pills to achieve the desired dosage strength.

all patients be affected by the differences in order to establish a separate class. Differences are “significant” if they affect physicians’ choices.

Classification decisions are made by the Ministry of Health, with input from a panel of medical advisors. Both government and industry reportedly stretch the interpretation of the criteria to meet their interests. Companies have frequently contested decisions with respect to clustering of new products and the DDD equivalence. For example, the grouping of the new, more expensive migraine therapy sumatriptan in the same category with two older drugs, ergotamine and dihydroergotamine, was challenged and only settled after a five-year law suit (Merck Frosst Canada 1996). Litigation has led to some revisions of the clusters over time.

5.3 Non-clustered Products (List 1b)

Non-clusterable products were included in Annex 6, now List 1b. Since these initially received full reimbursement, companies argued for placing most new products on this exempt list. Following rapid growth of expenditures on new products (over 20 percent per annum), in July 1993 List 1b was closed. New products could only be reimbursed if they could be added to an existing cluster, unless they were for the treatment of a disease for which no pharmacomedical therapy exists. This led to a growing list of “waiting room” products that were not admitted to reimbursement even though they had marketing approval. Companies therefore had incentives to argue for broad interpretation of the boundaries of existing groups as the only means to obtain reimbursement of new products. For example, this led to the grouping of SNRIs with SSRIs and angiotensin 2 antagonists with ACE inhibitors. Since 1997 some 1b products have been admitted to reimbursement, if they are priced below the price of reimbursed therapies for the same indication.

The decision process for reimbursement of new products now first determines whether the product is interchangeable with existing products. The options are: (1) to enter an existing 1a cluster and accept reimbursement at the RP for the drugs already in that cluster; (2) form a new cluster with a drug currently on list 1b and accept a new RP (for example, a new cluster was formed for statins following the entry of multiple products in the class); (3) if the new drug is not clusterable, and it is indicated for a disease for which no pharmaco-therapeutic treatment is available, then it is assigned to list 1b; (4) if the drug is not clusterable but there is an existing treatment, it may be reimbursed on list 1b if it is either effective and cheaper than existing medicines or lowers other costs, and if sufficient budget funds are available. If not, it is excluded from reimbursement. Formal cost-effectiveness guidelines are being established as a “fourth hurdle” for reimbursement of non-reference priced products.

With the easing of reimbursement restrictions on list 1b products, companies have incentives to emphasize the unique features of their products and to request shifting from list 1a to list 1b. As of June 1998, roughly 40 products on list 1b were awaiting a reimbursement decision based on rough cost effectiveness criteria. Some of these “waiting room” products were available through hospitals, which raises the possibility that patients may be hospitalized unnecessarily to obtain drugs. Marketing without reimbursement is theoretically feasible but rare in practice.

5.4 Setting the Reference Price

The initial 1991 RP levels were based on 1990 manufacturer list prices without regard to discounts given directly to pharmacists. 1990 price levels were used to preempt strategic price manipulation to influence the RPs. These 1990 RPs remained in effect until 1998, except that the 1996 Maximum Price Law (see below) imposed lower price caps for some products. In 1998 the RPs were revised downward based on these lower prices. In contrast to generic substitution programs in the United Kingdom and United States, RP in The Netherlands was not well designed to fully capture for payers

the discounts given to pharmacists and hence capture the potential savings on off-patent products, at least until the clawback introduced in 1998.

In order to compare prices for different compounds and set a common RP, The Netherlands uses a “standard daily dose,” based on the WHO DDDs with modification. First, the (unweighted) average price per DDD is calculated for each molecule in the cluster, including originator and licensed products and one or more generics. Second, the (unweighted) average of prices is calculated across molecules in a cluster. The reference price is set at the average or the price of the product immediately below the average price. Thus if the group consists of several originator products and several generics that are priced significantly lower, the RP may be defined by the price of a generic.

5.5 1996 Maximum Price Law

In 1996 a new system of maximum price regulation was superimposed on the RP system. Under the new law, a maximum price for each molecule/dosage form/strength is calculated, based on prices in Belgium, France, Germany and the United Kingdom, converted at current exchange rates, provided that the compound is available in at least two of the comparison countries. Specifically, the average is an (unweighted) average price per day at the ex-wholesaler level, using the package size with the lowest unit cost in each country, including all originator and generic products (excluding parallel imports). This maximum sets a ceiling on the price at which a manufacturer may sell a product, regardless of the reference price. These maximum prices are revised twice a year.

This resulted in price reductions averaging 15 percent, but with considerable variation across compounds. Whereas the RP system alone reportedly led to convergence of list prices at the RP, including price increases for products previously priced below the RP, the maximum price law forced a greater spread in the prices of different compounds within a cluster. Prices for different products in each compound were bunched at that compound’s maximum price and all capped by the reference price. In 1998, reference prices were reduced, based on these lower, price-capped prices.

5.6 Pharmacy Reimbursement and Incentives

The Dutch retail pharmacy sector is highly regulated with respect to entry and pricing. Pharmacists receive a fixed dispensing fee per script, rather than a percentage of the product price, to encourage substitution towards cheaper products. Pharmacists are authorized and encouraged to substitute a generic or a parallel import, provided that the script is generically written and the patient is informed,¹⁷ and the pharmacist retains one third of the difference between the RP and the list price of a cheaper product.

Pharmacists may also receive discounts from wholesalers. Since pharmacists’ capture 100 percent of private discounts but only 33 percent of a differential between the list price and the RP, manufacturers have incentives to compete for market share by offering discounts below the list price rather than by reducing the list price. The magnitude of these discounts was estimated at NG 300-400 million in 1994 (De Vos 1996), reduced to NG 360m. in 1997 (SKF, 1999), which implies an average discount of 8.9 percent. The reduction in discounts between 1994 and 1997 is attributable to the Maximum Price Law, which narrowed the price differentials between originator products and parallel imports and generics. This narrowed the pharmacist’s incentive to substitute, which in turn presumably reduced the incentive of manufacturers to give discounts. While discounts off list prices were large, most list prices including generics reportedly clustered close to the reference price, at

¹⁷ To inform patients, some pharmacists reportedly simply post a notice advising that substitution will occur unless the patient requests otherwise.

least until the maximum price law imposed lower ceilings. In July 1998, the government introduced a “clawback” of this discounts, in the form of a 4.7 percent reduction in reimbursement rates to pharmacies below the list price. This was reduced to 3.5 percent in 1999, and many single source drugs were explicitly excluded. Note that since the clawback is a fixed percentage, regardless of the discounts a pharmacy actually receives, it does not reduce and may increase the marginal incentive to seek discounts.

5.7 Effects of Reference Pricing

Manufacturer Pricing Response

In 1997, patient excess charges applied to only 3.8 percent of prescriptions (mostly oral contraceptives) and accounted for 0.5 percent of the drug bill (PPR Nov. 1998). Following the reduction in reference price levels in 1999, most manufacturers dropped their prices, such that co-payments remain only 0.6 percent of total expenditure (SFK, 1999). This evidence, that originator prices generally dropped to the RP, is consistent with the kinked demand model (Danzon and Liu 1996). It is unclear whether the apparent inability of manufacturers to maintain prices above the RP without severe loss of market share reflects patients’ unwillingness to pay surcharges or physicians concurrence with the clustering or their reluctance to explain differences. The Ministry of Health encourages patients to resist surcharges. In January 1996, the average brand-generic and brand-parallel import price differences were 19 percent and 14.7 percent, respectively; by 1997, these fell to 9.6 percent and 7.1 percent, due to the Maximum Price Law (PPR, Nov. 1998). These small price differences further confirm the lack of aggressive generic price competition in list prices.

The Maximum Price Law and increased interdependence of markets may change manufacturer response to the RP system. The kinked demand model of response to RP presupposes a single, isolated market. Increasingly, however, national pharmaceutical markets in the EU are interconnected due to parallel trade and regulation based on international price comparisons. With interconnected markets, manufacturers rationally attempt to set prices across markets at either a single level or within narrow bands (Danzon 1997a). These international spillover effects may dominate the incentive effects predicted by the kinked demand model for isolated markets. In particular, if the Dutch RP or ceiling price exceeds the manufacturer’s target EU price, $P_{eu} < RP_d$, the Dutch RP is not a binding constraint on the manufacturer’s optimal Dutch price, hence the manufacturer’s Dutch price may be at or below the Dutch reference price, $P_{eu} \leq P_d \leq RP_d$. However, if the Dutch RP is below the manufacturer’s target Europe-wide price, the manufacturer may set its Dutch price above RP_d ($P_{eu} \geq P_d > RP_d$), and may attempt to rebate the difference directly to the patient. If such rebates are not feasible, the manufacturer may maintain its price above the RP or, if this is not possible due to the maximum price law, may delay launch of a new product in The Netherlands, rather than accept a price below the target EU price. If maximum prices and RPs continue to fall, relative to other countries, the likelihood increases that new products will be withheld. Thus the future effects of Dutch RP system, combined with the maximum price law, on prices and availability of new medicines may be greater than the effects as of 1998.

Effects on Prescribing

The effects of RP on physician prescribing and manufacturer pricing are interdependent, as discussed above. If manufacturers have generally dropped their prices to the RP, as the anecdotal evidence suggests, physicians have no reason to switch patients between products in a cluster. Conversely, even if products in different clusters are potential substitutes, there is no financial incentive for the physician to choose a product in a lower priced cluster. Thus RP does not deter the shifting to higher priced products in other clusters.

Total Expenditures

The simultaneous adoption of several policies confounds measurement of the net effects of RP in The Netherlands from aggregate data, as in other countries. Nevertheless, simple

reasoning applied to the components of spending suggests that the effect of the pure RP system alone would probably not be significantly negative. The change in total drug expenditure dE can be decomposed into the Laspeyres (base-weighted) index of change in average molecule price, P ; change in volume, dV ; and shift in mix, dM :

$$dE = dP + dV + dM$$

The effect of the RP system on dP is theoretically uncertain but probably negative, assuming that the reduction in brand prices offset any increase in generic prices. Note that pharmacists had authorization and incentives for generic and PI substitution prior to the RP system, hence not all generic/PI share growth should be attributed to RP. The Maximum Price Law is expected to have a more negative effect on Dutch prices, especially brand prices. However, this direct price regulation, based on foreign prices, in a sense confirms the failure of the RP system to induce competition to reduce list prices, consistent with the kinked demand model and exacerbated by the system of pharmacy reimbursement.

RP is not predicted to affect volume V , since patient co-payments and physician financial incentives were unaffected. The effect of RP on mix upgrade M is also theoretically ambiguous. In the pre-1993 environment of full reimbursement of non-clustered List 1b drugs, RP applied to the clustered drugs plausibly created incentives to switch to the non-RP drugs, to avoid possible patient surcharges on RP drugs and associated time costs for physicians. Such switching may have been encouraged since manufacturers would rationally switch promotion from the price-constrained RP products to the unconstrained non-RP products.

Growth in M is expected to slow following the 1993 freeze on reimbursement of new non-clustered drugs, delay in launch of some new products and clustering of others with older products as the sole route to reimbursement. The net effect on total health spending is ambiguous, depending on whether the restrictions on outpatient reimbursement of new drugs led to unnecessary hospitalizations or other offsetting costs.

The limited evidence available confirms that RP has had at most modest effects on expenditure trends. Expenditure on pharmaceuticals grew 11.2 percent from 1989 to 1990, 8.3 percent in 1991 (with RP in effect for 6 months), but accelerated to 11.1 percent in 1992, with most of the growth in the unclustered drugs. However, annual increases in prices of new drugs averaged over 20 percent since 1988 (Rigter 1994), so this trend cannot be attributed solely, if at all, to the RP system. Figure 5.1 shows growth rates for volume, new products, and price 1989-93 (reproduced from Merck Frosst 1996). Consistent with the predictions outlined above, RP had no lasting effect on volume. There appears to be a perverse effect on price change, which was negative in 1989 and 1990, before RP, but slightly positive for 1991-1993, after the introduction of RP. The contribution of new products (M) was roughly unchanged. One possible explanation for this apparently perverse effect of RP on prices levels may be an increase in generic list prices; any offsetting increase in discounting would not be reflected in the prices to payers.

From 1994 to 1997, average expenditure growth was 5.6 percent a year. Strong structural growth, due to volume increases and shift to newer products, were offset by a 5 percent price cut in 1994, reduction in packsize in 1994 and the 15 percent price cut following the Price Law in 1996. Thus to the extent that the Netherlands has had negative price growth, this reflects pure price controls superimposed on reference pricing. The effect of reference pricing in the Netherlands appears to have been largely a one-off price reduction for branded products at the outset, followed by a second round of price cuts after the reference price levels were reduced in 1999. Between 1994 and 1999, since

prices fell by 20 percent but the RPs were still at the higher 1991 levels, they were often not a binding constraint. Growth resumed its more rapid pace of 12.4 percent in 1998, but was partially offset by the claw back of pharmacy discounts (SKF, 1999). If the objective was to stimulate ongoing competitive pressure on prices, there is no evidence that this has occurred. The authorization of pharmacists to substitute generics and parallel imports has resulted in competitive discounting to pharmacists, but the RP system is not well-designed to take advantage of this for payers and consumers. Moreover, this potential for savings requires only generic reference pricing, which existed since 1988, not the therapeutic reference pricing that was added in 1991.

5.8 Conclusions

To the extent that RP has reduced spending growth on pharmaceuticals, this has occurred primarily (perhaps solely) by reducing prices on branded products, particularly new products, and by delaying the launch of new products. The Maximum Price Law has presumably further reduced prices of innovative drugs relative to generics. Proponents might argue that price reduction on branded products is consistent with the objective of RP to encourage competition. However, such price changes are not necessarily consistent with efficient competition for two reasons. First, reducing prices for on-patent research-based drugs to the level of patent-expired generics essentially eliminates the value of patents and hence their usefulness as a policy tool to encourage innovation and R&D. Second, if physicians do not take the time to explain the product differences, patients may lack the information needed make informed choices and express their willingness to pay for higher quality products,

For the off-patent sector, the Dutch RP system has failed to promote competition to the benefit of payers and patients. Manufacturer discounting took the form of discounts to pharmacists, rather than lower list prices. Consequently, savings accrued primarily to pharmacists, not to payers, at least until the clawback of pharmacy profits. Pharmacists were not required to reveal their true acquisition prices (Rigter 1994). Moreover, pharmacists reportedly used their influence over wholesalers to limit competitive entry by mail order pharmacists. De Vos (1996) reports that “several companies wanting to introduce mail order pharmacy in The Netherlands have been boycotted by wholesalers. The companies were ready for business but found themselves without drugs to dispense.” Thus the Dutch experience demonstrates that RP is not a substitute for a competitive structure of the pharmacy market. RP’s failure to deliver significant savings in the off-patent sector is particularly ironic, in view of the unambiguous social benefits of competition after patent expiry.

There is inconsistency in the application of cost-effectiveness criteria within and outside the RP system. Although cost-effectiveness criteria have been adopted in considering reimbursement of non-RP drugs, the clustering of drugs within the RP system occurs without the same cost-effectiveness scrutiny and the two systems are not fully integrated. The rationale for setting a common RP for different products is that they are perfect therapeutic substitutes. If the perfect substitutability assumption is true, RP price signals create appropriate incentives for efficient prescribing and, in the long run, efficient investment in R&D. Conversely, if a CE fourth hurdle is applied as a condition for reimbursement and a new product meets this test *at a higher price* than the established therapy, then clustering the two products together with a common reference price distorts price signals for prescribing and R&D. Of course, if a new product B at price $P_b = 10$ is equally cost-effective with old product A at price $P_a = \$8$, then if the RP is set at 8 and the price of B drops to 8, B is more cost-effective at $P_b = 8$. However, prescribers have no incentive to prefer B over A, even though A is now less cost-effective than B. Thus superimposing RP on CE is likely to yield inappropriate price signals for both prescribing and for R&D.

6. New Zealand

6.1 Background and Cost Control Strategies

The 1993 New Zealand health care reforms established a form of internal market within the national health system, to encourage decentralized decision-making and increase competition and efficiency. Four government-owned regional health authorities (RHAs) were established to act as purchasers of medical services for their populations. For pharmaceuticals, a centralized purchasing strategy was retained. PHARMAC (Pharmaceutical Management Agency Limited) was established as a not-for-profit company owned by the RHAs to negotiate with pharmaceutical suppliers and determine subsidy levels for all outpatient drugs. In 1997 ownership of Pharmac transferred to the Health Financing Authority (HFA). Pharmac was established as a separate legal entity to reduce the Crown's involvement in litigation with the pharmaceutical industry (Pharmac 1999).

Pharmac is accountable to the HFA for managing pharmaceutical expenditures. Its functions include: (1) to define the Pharmaceutical Schedule, which is a positive list of 3,000 prescription drugs and related products that are eligible for subsidy (reimbursement); and (2) to set subsidy levels, if any. The Schedule is updated monthly and reprinted three times a year. It lists the price of each drug, the subsidy level and the guidelines or conditions under which the drug may be prescribed. Consumers may purchase other approved drugs, but without public subsidy or private insurance, which pays only for drugs on the Schedule. Thus admission to the Schedule is necessary for a drug to achieve significant sales.

Pharmac stated objectives are: (1) to get the best value, in terms of health gain, from the Government's expenditure on pharmaceuticals, when deciding which drugs to subsidize and at what levels, and (2) to "balance the needs of patients for equitable access to healthcare with the needs of taxpayers for responsible management of the costs they ultimately bear" (Pharmac, 1999).

Subsidy decisions are made by the Pharmac Board, using a list of criteria that include health needs, clinical benefits, overall budget impact and cost effectiveness (recently added as a formal criterion). It is advised by the Pharmacology and Therapeutics Advisory Committee (PTAC), comprising medical specialists and general practitioners, whose role is "to provide independent advice on the pharmacologic and therapeutic consequences of proposed amendments to the Pharmaceutical Schedule" (Pharmac 1997). These include review of company applications for Schedule listing, requests by Pharmac for delisting, management of the Schedule, and the need for review of specific drugs or groups of drugs. Following a review of the process for appointing PTAC members, they are now nominated following a formal advertising process. PTAC sometimes also comments on cost and funding priorities, since adding a new drug to the Schedule within a constrained budget implies reductions elsewhere..

Reference pricing was introduced in July 1993 with the intent to "reduce the excessive market segmentation based on brand marketing, which previously allowed suppliers to establish markets that were free from price competition" (Kletchko et al. 1995). In fact Pharmac has adopted a highly interventionist role in negotiating for low prices within the RP system. In addition, it uses a range of other tactics, including sole supplier contracts, tendering, restricted prescribing etc., discussed further below.

6.1 Classification within the RP System

All reimbursed products are assigned to therapeutic groups (pharmaceuticals that are used to treat the same or similar conditions) and subgroup (pharmaceuticals that produce the same or similar therapeutic effects in treating the same or similar conditions) (Kletchko et al. 1995). Defining groups

by indication and therapeutic effect is likely to lead to broader classes than RP systems that define clusters primarily by compound or mode of action, as in Germany. For example, New Zealand groups all H2 antagonists (cimetidine, ranitidine, famotidine, nizatidine) in a single class, whereas Germany distinguished two classes. Patent status is not considered in New Zealand. Most but not all subgroups are subject to RP.

6.2 Setting the Reference Price

New Zealand sets the reference price at the lowest price in each subgroup, regardless of patent status or market share. Pharmac negotiates a reduction in the reference price as a condition of admitting new products to reimbursement (see below). In principle manufacturers may charge more than the RP. However, in some cases Pharmac may be unwilling to reimburse a product that is priced above the subsidy level. Pharmac may also eliminate the subsidy for an existing product if a substitute product becomes available at a lower price and Pharmac considers that the higher priced product has no additional clinical benefit. In this case, RP is equivalent to pure price control, since the manufacturer must accept the RP as the maximum price as a condition of reimbursement. This contrasts with the German RP system that, at least in theory, permits manufacturers to charge more than the RP if patients are willing to pay the excess.

6.3 Admitting New Products

A newly approved product is only admitted to reimbursement in an established subgroup if the manufacturer offers a significant price reduction (usually 30 percent) relative to the existing reference price for that subgroup or a cross-therapeutic deal with another group (see below). For generics, the first generic usually must offer a 30 percent price cut, the second an additional 20 percent cut, and so on, although the required discounts for generics are becoming less rigid. Each lower price then becomes the new reference price for other products in the subgroup.

In a cross-therapeutic deal, a manufacturer agrees to reduce its price on one product (typically a product with a small market share) in return for reimbursement of another, usually newer product that has a larger market share for the subgroup. For example, in 1996 a 40 percent price cut on Tagamet® was offered in return for a listing on the Schedule for Famvir® (famciclovir), thereby reducing the reference price of all H2 antagonists by 40 percent (PPR Aug. 1996). Reference prices in several groups may thus change any time a new product enters the market. In addition, new groupings and price changes may be initiated at any time following a Therapeutic Group Review initiated by Pharmac. The Schedule is revised monthly or oftener if price changes occur.

New products that are not clusterable into an existing therapeutic group may nevertheless sometimes be reimbursed on the Schedule once agreement has been reached on a reimbursement price, which could entail lengthy negotiations. For example, Serevent® was listed after five years of negotiations; Imigran® tablets were submitted for review four times in five years. In deciding whether to accept a relatively low price, manufacturers presumably weigh the possible spill-over effects to other markets of a low price in New Zealand, against the lost sales in New Zealand. Formal cost-effectiveness and cost-utility analysis are increasingly used by Pharmac to determine which patient subgroups should have access to new drugs, if listing is granted.

6.4 Other Cost Control Strategies

In addition to RP to control prices, Pharmac uses other strategies to control volume and expenditures and to attempt to target expensive medicines to those with greatest expected marginal gain.

Restricted prescribing The prescribing of certain products is restricted to specialists with appropriate experience (for example, Prozac® before negotiation of a the budget cap).

National guidelines and special authority requirements National prescribing guidelines are drawn up with the relevant medical practitioner associations to limit the severity or type of condition for which the medicine may be used, in order to target expensive drugs to those patients who are expected to benefit most. For very expensive medicines (NZ\$25,000 per patient per annum or NZ\$100,000 one-time cost), national guidelines, individual assessment of each patient and case management may be used (Kletchko et al. 1995). For secondary care drugs, financial risk is borne by hospitals, which are paid fixed fee-per-service, but national guidelines also may apply.

Pay to play contracts Suppliers are paid a negotiated, upfront amount to make a product available at a lower price.

Tendering, sole supply and preferred supplier contracts A supplier is offered a larger market share in return for a lower price. For example, a tender for paracetamol capsules and tablets led to a 44 percent reduction in cost (Pharmac 1997).

Risk sharing contracts In price-volume contracts, the price varies inversely with volume. Many generics are subject to such contracts.

Average daily dose contracts The subsidy is tied to a specified average daily dose and the supplier must pay a rebate if this average dose is exceeded, thereby shifting the risk of increasing daily dosages to the supplier.

Capped annual maximum budgets Listing of a new drug may be contingent on the manufacturer accepting risk-sharing through a capped annual budget with pay-backs for overruns, and possibly price reductions on drugs already listed.

6.5 Pharmacists

Retail pharmacy in New Zealand is heavily regulated. Restrictions on entry, prohibitions on non-pharmacist ownership and on branching and other measures discourage price competition at the retail level. Pharmacists have been paid a fixed fee per script plus a percentage of the price, set at 11.28 percent of the final price (inclusive of 12.5 percent GST and 10 percent wholesale margin). This fixed percentage margin creates incentives for pharmacists to prefer higher priced products, which yield a larger absolute fee. More generally, regulation of retail margins undermines incentives for retail price competition. The wholesale margin also is officially regulated but in practice wholesalers compete by transferring part of the official wholesale margin to the retail pharmacists. Since competition at the retail level is weak, competition at the wholesale level may accrue to pharmacists rather than being passed on to patients or payers. The combined distribution margins plus tax add a mark-up of 86 percent over the ex-manufacturer price, which applies also any surcharge over the RP. Thus the full surcharge to the patient is 1.86 x manufacturer surcharge over RP (Pharmac, 2000).

Generic substitution permits the pharmacist to substitute generics unless the physician explicitly prescribes the brand and writes “no substitution.” Under the traditional percentage margin reimbursement, pharmacists have no incentive to substitute a cheaper product, since a lower list price would yield a lower absolute margin. The proposed changes to a fixed dispensing fee would change

this if the pharmacist were permitted to retain some of the savings in list price. Pharmac's preferred supplier contracts, which may include the requirement for the pharmacist to dispense the preferred generic product, could be viewed as a government imposed surrogate, given the lack of decentralized competition in retail pharmacy.

However, the savings from competition in the off-patent sector alternatively could be achieved by opening up retail pharmacy to competition, including competitively determined, fixed dispensing fees, rather than percentage of the price, and with the RP reimbursement levels revised downward periodically based on the distribution of actual supply prices, as occurs in the UK and the US managed care programs. Compared to the preferred supplier programs, this would provide ongoing competitive incentives but with greater choice for patients and doctors and less uncertainty for manufacturers than tendering and preferred supplier contracts.

6.6 Physicians

Physicians have traditionally had little direct incentive for price-conscious prescribing. The patient co-payment is the lesser of the cost of drug or a fixed payment per script (\$3 or \$15, depending on welfare and other status) independent of the price, plus any price premium if the price exceeds the subsidy. Meanwhile, strategies to influence prescribing include provision of information, limiting certain drugs to specialists and/or specific conditions,¹⁸ clinical audit and counter-detailing. Seventy percent of GPs are in 53 IPAs, which provide voluntary guidelines to their members, monthly charting of prescribing relative to the average and similar services.

6.7 Litigation

Pharmac and the industry have been involved in extensive litigation. Individual companies have sued over listing and subsidy levels for individual products and over more basic structural features of the system, usually without success. In general, the courts have upheld the autonomy of Pharmac in reaching its decisions. For example, in the Rickett and Coleman case, the High Court ruled that Pharmac is entitled and obligated to take cost into account in reaching its decisions, and that it has statutory authority not to have its day-to-day commercial decisions subjected to scrutiny of review. In another case, the High Court concluded that Pharmac and PTAC are expert bodies and that courts are not qualified to second guess the substance of their decisions. Challenge based on even-handed treatment of similarly placed drugs has been successful in some cases.

The Research Medicines Industry (RMI) has also challenged the system as a violation of competition law. In particular, if Pharmac is viewed as a purchasing agent, its use of cross therapeutic deals, negotiations that play off one company against another and sole supply contracts might be viewed in violating standard requirements for competitive procurement. However, the outcome was an exemption of Pharmac from the NEW ZEALAND Commerce Act.

6.8 Effects of RP Expenditures

Aggregate expenditure trends at best provide a rough measure of the effect of Pharmac's combined set of control strategies, including RP, plus the launch of new products and maturing of others. With that caveat, Table 2 reports trends in government pharmaceutical expenditures for 1987-1996. The average annual percentage increase is 4.7 percent in nominal terms, 0.7 percent in real terms after adjusting for CPI inflation. Adjusting for population, the real rate of growth of spending per capita is -0.2 percent on average over the period. However, breaking down the overall average into 3-year subperiods indicates a slower real rate of growth for the period 1987-1993, before the launch of RP,

¹⁸ For example, statins require a doctor's application for each patient and approval depends on risk factors.

compared to 1993-1996, the first three years of RP under Pharmac. A comparison of subperiods is sensitive to the endpoints chosen and may be confounded by changes in the mix of drugs over time, since new drugs are a major driver of drug spending in all countries. However, this evidence does cast doubt on the charge that real expenditure per capita was growing excessively prior to 1993 and that Pharmac significantly reduced the rate of growth, at least during the first three years of RP, before other purchasing strategies became common.

Figure 4 shows trends in total government pharmaceutical expenditures, from 1993 –2000, decomposed into trends in prices, volume and mix (a residual). The price index has declined, but total spending has increased, reflecting growth in volume and mix. Pharmac reports only 3 percent spending growth rate per year in New Zealand, compared to 8-10 percent in other OECD countries. Without a comparison of what benefits have been foregone to achieve these savings, a full evaluation is not possible. The reported negative price growth in New Zealand could under or overstate the full effects of RP. If the price change is measured using a Laspeyres (base weighted) price index, it would not reflect the effect of RP on the prices of new drugs, since it would only capture the post-launch price changes. Moreover, RP and associated policies may delay the launch and slow the diffusion of new drugs, contributing to slower mix upgrade. On the other hand, some of the negative price effect presumably reflects Pharmac's other purchasing strategies, such as tendering for sole suppliers of off-patent drugs and drug-specific expenditure caps. Estimating the net effect of RP, strictly defined, is therefore not possible.

RP has reportedly reduced prices, presumably mostly for branded products "Suppliers tend to lower their prices to the new subsidy level rather than risking market share. Where prices are not lowered, patients tend to switch to fully subsidized alternatives rather than pay a premium ." (Kletchko et al. 1995). But surcharges have survived in some cases, although with loss of market share. For example, the statin class of cholesterol lowering medicines was fully subsidized until July 1997, but with tight controls on prescribing. Following RP, the subsidies on two of the three statins fell substantially. The significant partial charges that remained led to loss of market share (Woodfield et al. 1997).

Assuming that RP has reduced prices below the level that would have occurred without RP, this would overstate the net budget and social savings if there are offsetting costs that result from non-optimal prescribing as patients are switched to subsidized products. These costs are expected to be higher in New Zealand than in other reference price systems (for example, Germany or The Netherlands) because of the potentially large, frequent and unpredictable changes in reference prices and subsidies. In New Zealand the reference price may change whenever Pharmac is able to negotiate a lower price with one supplier. Whenever changes occur, if a patient's current medication retains a price premium, the patient would either have to pay the premium or switch to a different, reference priced product. Such changes are likely to be particularly harmful and costly for chronic medications for the elderly, where switching drugs can cause confusion, noncompliance, dosing error and real harm.

In 1997, Pharmac considered 84 applications for subsidy, of which 55 were listed and 29 were declined, implying an acceptance rate of 65 percent. Limited information on applications declined is shown in Table 3. Of the 97 applications declined between 1994 and 1997, 42 (43 percent) were for new chemical entities and the remainder were for new presentations or new products of existing compounds. These data suggest that Pharmac has significantly restricted entry, both for new compounds and for new forms of old compounds. The evidence from countries with competitive retail pharmacy sectors and hence competitive generic markets (the United States, United Kingdom, Canada) indicates that restrictions on new forms of old compounds restricts competition, leading to

foregone potential savings on off-patent compounds (Danzon and Chao 2000). This is clearly contrary to the stated objective of RP.

6.9 Conclusions

In evaluating the New Zealand experience with RP, the relevant question is whether, given the budget constraint, this form of RP is a reasonably efficient strategy for achieving the goal of maximizing health benefits. The question of whether it is appropriate for Pharmac to operate within a budget constraint and, if so, whether the present drug budget is optimal, is a larger question beyond Pharmac's control and beyond the scope of this paper. However, like any "silo budgeting" arrangement, this system is prone to the inefficiencies because Pharmac's focus is on the drug budget, without necessarily considering any effects of its decision on drugs for resource use under other health budgets.

One of the theoretically attractive features of RP is that it can target public funds to basic care while leaving patients to pay for higher "quality" if they desire. However, to the extent that Pharmac denies any reimbursement to products that are priced above the RP, patient willingness to pay for incremental benefit is not subject to a market test. This distorts relative prices facing patients and doctors. It acts as a tax on quality, assuming that higher priced products are generally superior in at least some respects.

Pharmac can probably claim some success in reducing prices on outpatient drugs. However, net social savings are almost certainly smaller than implied by any measure of pure price effect, assuming that the frequent and unpredictable price changes and any associated switches in therapeutic choices by doctors result in some adverse health consequences for patients and/or lead to other unnecessary medical expenses, such as doctor or ER visits. Administrative costs associated with appeals for special authorities are also a concern

Pharmac has not succeeded in using RP for its most appropriate use – achieving low generic prices and widespread generic substitution for off-patent drugs. Pharmac (1997) reports a study of ten widely used drugs (which are presumably off patent), in which prices in New Zealand were found to be 10-30 percent higher than prices in the United Kingdom or Australia. High generic prices are blamed on a number of factors, including regulatory barriers and strategies of brand name companies. However, the alleged strategies of the brand companies would not be practical in countries with more competitive retail pharmacy sectors, such as the US, where competition leads generic producers to cut prices to gain market share, leading to savings for consumers and payers. In particular, if RP is not combined with incentives and authorization for pharmacists to substitute low price generics and compete on the retail prices charged to payers and patients, then there is little or no competitive pressure on manufacturers to set list prices below the reference price. On the contrary, with percentage margins, pharmacists prefer more expensive drugs, hence generic suppliers tend to compete by raising rather than reducing list price. In this environment, any price cuts are in the form of discounts off list prices that accrue to pharmacists, not to payers.

Although Pharmac's stated goal is to stimulate competition, certain strategies suggest use of monopsony power to force prices down to marginal cost. Indeed, in cross-therapeutic deals a firm might accept a price below its marginal cost for an old product with small sales in subgroup X, in return for being admitted to reimbursement on a newer product with larger potential sales in subgroup Y. By depressing the reference price and hence reimbursement in subgroup X, much larger losses are imposed on companies with newer products and larger market shares. Defining the boundary between appropriate stimulus to competition and inappropriate exploitation of monopsony power is empirically problematic. Defining the appropriate amount of competition for patented products is also

problematic. However, grouping new, on-patent products with old generics potentially undermines all patent protection, hence goes beyond appropriate levels of competition.

Companies may be reluctant to withdraw established products even at very low prices, because most costs are sunk and withdrawal may cause serious loss of reputation and goodwill with patients and physicians. But in the longer run, companies will be reluctant to launch new products in countries that price very low relative to the average in industrialized countries, particularly if future pricing is highly unpredictable as in New Zealand. Between 300 and 400 products are reportedly not available in New Zealand because of the low prices (PPR Aug. 1996) and some companies have reduced or terminated their investments.

New Zealand's small global market share -- 0.2 percent of global drug sales (PH97) -- creates a great temptation to exploit Pharmac's monopsony power, free riding on other countries' willingness to pay for R&D. In the past this may have been possible. However, with the breakdown of companies' ability to segment markets, due to the growth of parallel trade and cross-national price comparisons, companies will be increasingly reluctant to accept prices that are lower in New Zealand than in other major markets. Delay in the launch of innovative products is likely to increase.

7. Conclusions

RP applied to generically equivalent products is a potentially efficient strategy to encourage competition, so that generics do not simply shadow brand prices after patent expiration. Generic substitution policies in the United States and, to some extent, the United Kingdom illustrate the successful use of this type of strategy, although not the term reference pricing is not used. By contrast, Germany, The Netherlands and New Zealand, although often viewed as pioneers in RP, have not used it successfully to capture potential savings in the off-patent sector. The major lesson is that simply setting a common reference price for reimbursement does significantly constrain prices above that level but does not automatically generate competition below the reference price. Such dynamic competition to set prices below the reference price requires competition in retail pharmacy, which does not exist in many countries with RP, including the three studied here. Although competitive discounting to pharmacists does occur in The Netherlands, the savings are not captured by payers, unless these discounts are specifically clawed back.

RP applied to therapeutic substitutes is consistent with efficient reimbursement *only* if applied to products that have equivalent therapeutic effects, including side effects, at the dosage to which the common price is applied. How well the existing systems meet this equipotency criterion is a matter on which experts differ. However, it is clear that judgments are not based on formal comparison of effectiveness and the DDDs used to compare products do not require equipotency. In that case, RP could distort the cost-effectiveness of prescribing decisions and hence of R&D investments. The opportunity that exists in theory for manufacturers to charge an excess for a superior product is apparently not operational in practice. Whether this reflects physicians' unwillingness to pay a time price, rather than patients' unwilling to pay an excess charge, unfortunately cannot be determined from the available data.

RP clearly has reduced brand prices, but effects on overall price levels are less certain. Theory suggests that an increase in prices of generics and of non-RP products is possible and some evidence is consistent with this. RP is not expected to affect volume or mix upgrade -- indeed it may exacerbate switching to non-referenced products. Not surprisingly, RP has not controlled total expenditure growth. Countries that use RP have also adopted other controls. These include budget caps in Germany, a freeze on admission of new products and the maximum price law in The Netherlands, and

a range of forms of volume/price contracts in New Zealand. Although these strategies may slow the growth of expenditures, none are well designed to achieve efficient use of resources.

Although RP may reduce prices – and even this is not assured – the effect on total social costs may be less, to the extent there is cost shifting to patients or other medical services, adverse health effects if patients switch to less appropriate medicines, and administrative costs. Moreover, as RP systems become more aggressive – for example, in The Netherlands and New Zealand – while at the same time companies seek to maintain prices within a narrow band in all major markets, aggressive RP will lead to delay in launch of new products in countries unwilling to pay the common price. The message to research-based firms is that there is no reward for improving products in an established class and that imitation is rewarded but innovation is not.

Designing reimbursement and co-payment systems that provide incentives for cost-conscious use of resources is a critically important but difficult challenge for public and private health insurers. Alternatives other than RP that provide a better trade-off between the competing goals of access for patients, cost control for payers and incentives for innovation.

References

- Danzon, P.M. 1997a. "Price Differentials for Pharmaceuticals: Welfare Effects in the US and the EU." *International Journal of the Economics of Business*
- Danzon, P.M. 1997b. Price Regulation In The Pharmaceutical Industry: National vs. Global Interests. Washington, D.C., The American Enterprise Institute Press.
- Danzon, P.M. 1998a. "Competition in the Off-Patent Sector: The US Experience." *Pharma Pricing Review* 3(3): 46-50.
- Danzon, P.M. 1998b. "The Economics of Parallel Trade" *PharmacoEconomics* 13(3): 1-12.
- Danzon, P.M. 1996. "Defined Daily Doses for Pharmaceuticals." Working Paper, Health Care Systems Department, The Wharton School.
- Danzon, P.M. and J. Kim. 1998. "International Price Comparisons for Pharmaceuticals: Measurement and Policy Issues." *Pharmacoeconomics* 14 (1) 115-128.
- Danzon, P.M. and H. Liu. 1996. "RP and Physician Drug Budgets: The German Experience in Controlling Pharmaceutical Expenditures." Working Paper, Health Care Systems Department, The Wharton School. Under revision.
- Danzon, P.M. and L. Chao. 2000. "Does Regulation Drive out Competition in the Pharmaceutical Market?" *Journal of Law and Economics*.
- De Vos, Cornelis M. 1996. The 1996 Pricing and Reimbursement Policy in The Netherlands. *Pharmacoeconomics* 10 Supp.2:75-80.
- Ellis, R. and McGuire, T. 1991. "Optimal Payment Systems for Health Services." *Journal of Health Economics* 9: 375-396.
- Frank, R. and Salkever, D. 1992. "Pricing, Patent Loss and the Market for Pharmaceuticals." *Southern Economic Journal* :165-79.
- Giuliani, G., G. Selke and L. Garattini. 1998. "The German Experience in RP." *Health Policy* 44:73-85.
- Grabowski, H. and Vernon, J. 1996. "Prospects for Returns to Pharmaceutical R&D under Health Care Reform." In Helms, R. (ed.), Competitive Strategies in the Pharmaceutical Industry, Washington, D.C., The American Enterprise Institute Press.
- Gross P.F. and Fortescue R. 1997. Therapeutic Pricing for Prescribed Medicines in Australia: Review of Similar Reforms Internationally and Likely Impact of the Government's 1997/98 Budget Proposals. Melbourn, Australia: Health Economics Strategies.
- Himmel, et al. 1997. "Changes in Drug Prescribing Under the Public Health Reform Law – A Survey of General Practitioners' Attitudes in East and West Germany." *International Journal of Clinical Pharmacology and Therapeutics* 35 (4): 164-9.

Maassen, B.M. 1994. "Reimbursement for Medicinal Products: The German Reference Price System - Law, Administrative Practice and Economics." Discussion Paper, Hengler Mueller Weitzel Wirtz, Rechtsanwälte, Brussels.

Kletchko, SL, Moore, DW, Jones KL. 1995. "Targeting Medicines: Rationalizing Resources in New Zealand." PHARMAC, Wellington, New Zealand.

Merck Frosst. 1996. Policy Paper on Health Care Cost Containment

Pauly, M. 1968. "The Economics of Moral Hazard." *American Economic Review* 58: 231-237

Pharmaceutical Management Agency Ltd. (Pharmac). 1999. Briefing Paper for the Minister of Health (December 1999). www.

Pharmaceutical Management Agency Ltd. (Pharmac). 2000. Business Plan 2000-01. (July 2000).

Pharma Pricing Review (PPR). Various issues.

Richter, H. 1994. "Recent Public Policies in The Netherlands to Control Pharmaceutical Pricing and Reimbursement" *PharmacoEconomics* 6 Suppl. 1: 15-21.

Ulrich, V. and E. Wille. 1996. "Health Care Reform and Expenditure on Drugs: The German Situation." *PharmacoEconomics* 10 Suppl. 2: 81-88.

Verband Forschender Arzneimittelhersteller Statistics 2000 . Berlin.

Wedig, G. 1993. "Ramsey pricing and supply side incentives in physician markets." *J. Health Economics* 12 (4) 1993:365-482.

Woodfield, A., Fountain, J. and Borden, P. 1997. Money and Medicine Merck Sharp and Dohm, N.Z.

Zeckhauser, R. 1970. "Medical Insurance: A Case Study of the Trade-Off Between Risk Spreading and Appropriate Incentives." *JET* 2(1): 10-26.

Figure 1. New Zealand Expenditure Growth 1992-1997

Subsidy, Volume, Mix, and Cost Indices. Four-quarterly moving averages, years end 30 June. Base: September quarter 1992=1000

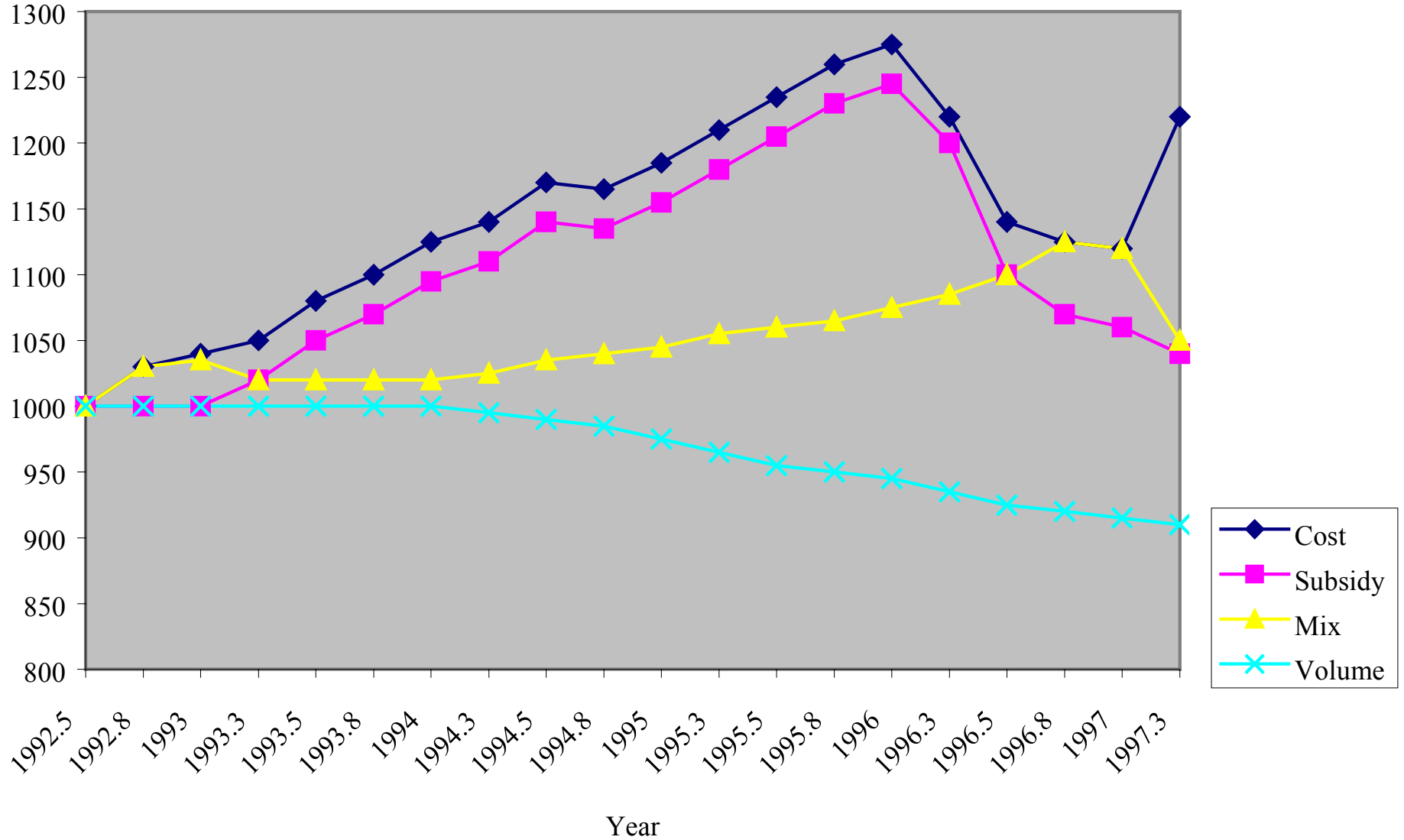


Table 1 Germany Statutory Health Insurance: Pharmaceutical Expenditure Growth 1987-99

Year	Growth (percent)			Structural component ^a		
	Sales	Volume of prescriptions	Price	Total (percent)	interdrug effect (percent)	intradrug effect (percent)
1987	6.8	3.7	0.7	2.3	0.4	1.9
1988	8.5	4.1	1.1	2.7	0.8	1.9
1989	0.8	-3.5	1.0	2.9	0.0	2.9
1990	6.5	5.3	-0.1	1.3	-0.4	1.7
1991	10.8	3.8	1.5	5.1	2.5	2.7
1992	9.8	3.2	2.0	4.3	1.8	2.5
1993	-14.5	-10.1	-3.9	-0.8	-0.9	0.1
1994	4.6	-3.1	-1.2	9.0	NA	NA
1995	7.1	6.3	0.2	0.7	NA	NA
1996	6.3	-3.5	0.0	8.7	NA	NA
1997	-4.6	-11.3	-0.8	11.3	NA	NA
1999	5.1	-2.9	0.5	7.5	5.1	2.4

a The interdrug effect reflects expenditure change due to prescribing different drugs. The intradrug effect reflects change in package sizes or dosage form. The negative interdrug effect in 1993 indicated that physicians tended to substitute cheaper drugs for more expensive products.

Source: Ulrich and Wille (1996) for 1987-1993
PPR (Nov. 1998) for 1994-7
Vfa (2000) for 1999.

Figure 2 Pharmaceutical Expenditure Growth in The Netherlands 1989-1993

Percent growth over previous year

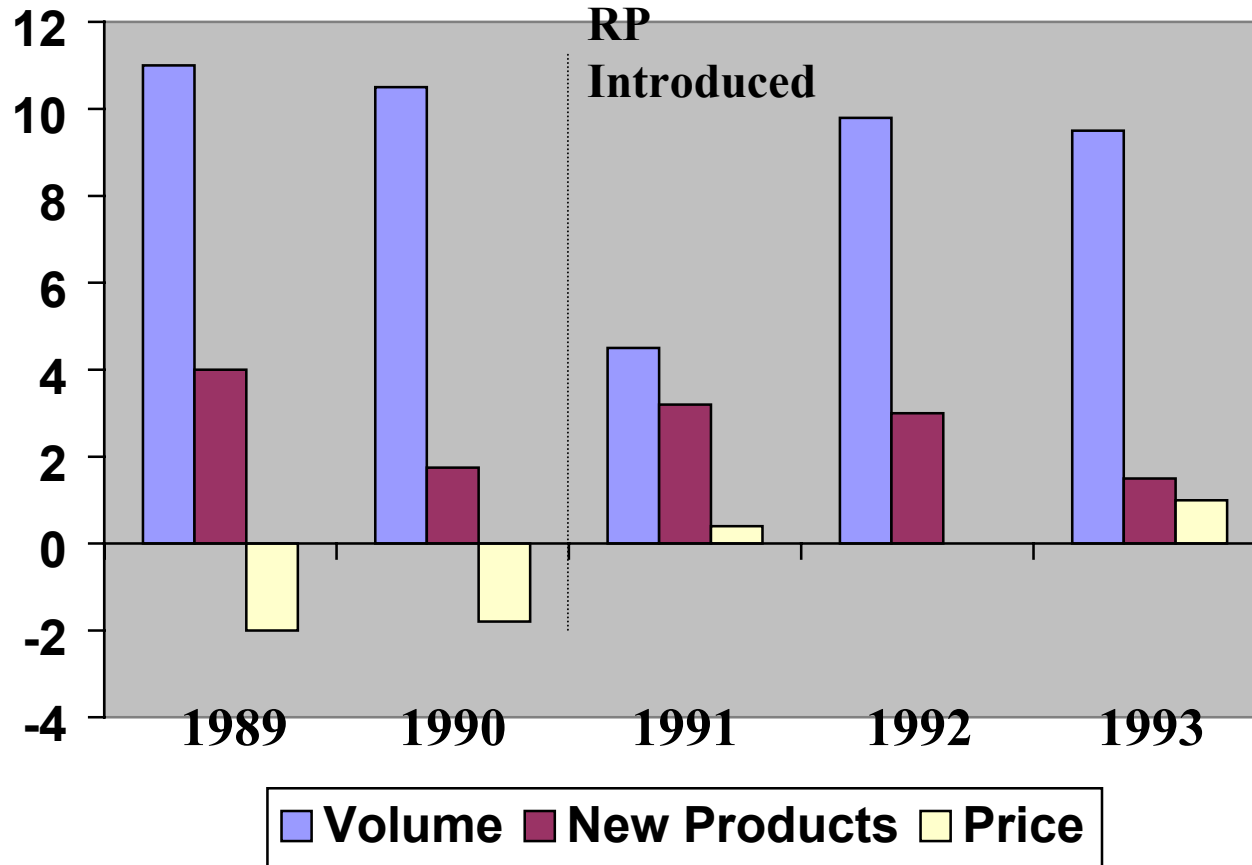


Table 2. Pharmaceutical Expenditure by Government – New Zealand 1987-1996

Year (f)	CPI(a)	Population(b) (000)	Nominal(c) (\$000)	Real(d) (\$000)	Real per cap(d)	Pharm expenditures/total public health expenditures
1987	2338	3282	439601	664666	202.52	0.1387
1988	2651	3310	506660	675610	204.11	0.1376
1989	2788	3318	549382	696580	209.94	0.1374
1990	3022	3344	522600	611314	182.81	0.1249
1991	3153	3385	545331	611400	180.62	0.1229
1992	3190	3425	556373	616544	180.01	0.1243
1993	3227	3462	582931	638568	184.45	0.1299
1994	3270	3502	640697	692618	197.78	0.1316
1995	3377	3552	674080	705617	198.65	0.1306
1996(e)	3467	3590	694000	707611	198.31	0.1299
1997(e)	3535					
	Percentage change (g)		57.90 percent	7.10 percent	-2.10 percent	-6.30 percent
	Average annual percentage change (g)		4.70 percent	0.70 percent	-0.20 percent	-0.70 percent
	<i>87-93</i>		<i>5.40 percent</i>	<i>-0.70 percent</i>	<i>1.50 percent</i>	<i>-1.10 percent</i>
	<i>87-90</i>		<i>6.30 percent</i>	<i>-2.70 percent</i>	<i>-3.20 percent</i>	<i>-3.30 percent</i>
	<i>90-93</i>		<i>3.80 percent</i>	<i>1.50 percent</i>	<i>0.30 percent</i>	<i>1.30 percent</i>
	<i>93-96</i>		<i>6.40 percent</i>	<i>3.60 percent</i>	<i>2.50 percent</i>	<i>0.00 percent</i>

Notes

Italicized numbers were computed.

Sources:

<http://www.nzhealth.co.nz/rmi/annual/trends.html>

a. CPI Index 1993-95: Ministry of Health Publication "Health Expenditure Trends 1980-1995" (Appendix 3).

b. Population 1987-95: Ministry of Health Publication "Health Expenditure Trends 1980-95" (Appendix 3).

population 1996: Personal Communication, Statistics New Zealand.

c. Government Pharmaceutical Expenditure 1987-1995"

(Appendix 8).

Government Pharmaceutical Expenditure 1996: Pharmac Annual Review 1996

(Graph 1, page 4).

d. Real expenditures is in 1996 prices.

e. All real numbers in the table were originally calculated based on the 1996 CPI index value given by the Researched Medicines Industry. The table was recalculated using the the CPI index values from Statistics New Zealand as found in the Ministry of Health publication "Health Expenditure Trends 1980-1997."

f. The year indicates the first half of that year and last half of previous year

g. Figures for real and real per capita computed by Researched Medicines Industry using real numbers based on their 1996 CPI index figure.

Table 3 Estimated Cumulative Annual Savings(1) – New Zealand
Years ended 30 June. In thousands of dollars.

	<u>1997</u>	<u>1996</u>	<u>1995</u>	<u>1994</u>
New chemicals	2,236	927	590	(200)
New presentation	3,553	2,391	1,163	100
Subsidy changes	17,440	5,100	(11)	-
New products	32,532	27,740	21,276	1,200
Reviews	21,644	11,119	6,350	1,100
De-restrictions	(687)	(170)	-	-
De-listing	3,850	800	450	-
Total Savings	80,568	47,907	29,818	2,200

Most savings come from price competition, and reviews that aligned subsidies for similar products.

1. Derived from estimates of savings as a result of decisions taken between 1 July 1994 to 30 July 1997.

The estimates are based on full subsidized cost, which includes wholesale and retail mark-ups. Dispensing fees and GST.

The estimates under-estimate real savings because current data from the North Health pharmaceuticals payment system was not available at the time of calculation and was therefore not incorporated.

Table 4 Listing changes to the Pharmaceutical Schedule (1) – New Zealand

Years ended in 30 June

	<u>1997</u>	<u>1996</u>	<u>1995</u>	<u>1994</u>	<u>Total</u>
Number	11	7	8	11	37
New chemical entity listed	24	23	18	23	88
New product listed	20	32	46	40	138 (2)
Total new listings	55	62	72	74	263
De-restriction or expanded	10	13	14	16	53
Changes that restrict or limit	60	4	4	0	14
De-listing	14	0	0	0	14

In four years 263 new or enhanced products have been listed; access has been widened to a further 53; and 28 products have either been restricted or de-listed.

- 1. This data does not reconcile with last year's PHARMAC review because the basis has been changed to implementation date rather than decision date.*
- 2. Does not represent the total number of products added to the Schedule, since the listing of one new chemical entity can result in the listing of more than one product. The total number of products added to the Schedule, as at 30 June, 1997, is actually 286.*
- 3. By decision, not necessarily the number of chemical entities affected.*

**Table 5 Applications Declined by PHARMAC Board(1)
– New Zealand**

	<u>1997</u>	<u>1996</u>	<u>1995</u>	<u>1994</u>	<u>Total</u>
New chemical entities	14	5	8	15	42
New presentations	3	8	3	5	19
New products	11	5	9	4	29
De-restrictions	1	1	1	4	7
Totals	29	19	21	28	97

This year, PHARMAC considered 84 applications for subsidy, of which 55 were listed and 29 declined. The acceptance rate is therefore 65 percent.

- 1. This data does not reconcile with last year's PHARMAC Review because the basis has been changed to implementation date rather than decision date. In some cases, the application is for more than one product.*

Figure 3. Market Structure & Development-Germany

