

The structural dynamics of the pharmaceutical industry

An analysis of prescription drug costs in the United States & Canadian Markets

Kylie Douglas

Department of Economics
Indiana State University
Terre Haute, IN 47809 USA

Robert Guell

Department of Economics
Indiana State University
Terre Haute, IN 47809 USA
r-guell@indstate.edu

It is axiomatic that prescription drug prices are higher in the United States than Canada. While many politicians and consumer advocates consider this *prima facie* evidence of drug company greed, economists are less quick to judge. The monopoly offered by patents generates the profits that are necessary to motivate innovation. Still, the evidence is rather overwhelming that drug prices vastly exceed their marginal production costs. The existence of price controls in many nations creates an exaggerated version of price discrimination in the pharmaceutical industry and this, in turn, offers a unique ability to directly measure the loss in efficiency that results from the market structure of this industry.

We begin by offering *prima facie* evidence that pharmaceutical industry profitability is inefficiently high and continue by describing the Guell (1995, 1998) methodology for estimating pharmaceutical static inefficiency. We note that reducing static inefficiency,

that which arises at the production-sale stage, comes at a cost of creating dynamic inefficiency, that which arises when too little is invested in research and development. We proceed by noting that the Food and Drug Administration's ban on the re-importation of prescription drugs in the United States is an example of price discrimination that allows us to use Canadian controlled drug prices to function as an upper-bound estimate of marginal cost. We conclude by using these 2002 Canadian prices to update dead weight loss calculations found in Guell (1995, 1998) in which the 1993 United Kingdom drug price data reported by the U.S. Congress's General Accounting Office was used to create dead weight loss estimates.

The *Prima Facie* Case

There has been a great deal of concern in recent years about the rising costs of prescription drugs in the United States. The popular sentiment is that Ameri-

cans are paying far too much for their medications and there is an abundance of evidence that the patent-created monopoly power leads Americans to pay more for their prescriptions.

There is no debating the fact that U.S. pharmaceutical companies enjoy very large profits. In comparison to other industries, pharmaceutical manufacturers are the highest-ranking industry in terms of profitability. Over the last several years, the median profitability for all Fortune 500 firms was less than one third of the profitability of the pharmaceutical industry. (Kaiser, November 2001).

This is exacerbated by the fact that prescription expenditures are growing more quickly than overall health care spending. While the rate of growth in prescription drug spending has decreased since 1999 and is expected to continue to decrease in coming years, its average annual rate of increase is projected to be 11.1 percent through 2012. (Heffler).

There are three main factors contributing to the recent increase in the relative position of prescription drugs in health care expenditures. First, as new drugs for common maladies have become prevalent, the sheer number of prescriptions written has increased. Second, the types of drugs prescribed have changed to newer and more expensive drugs. Finally, manufacture price increases account for about 26 percent of the change (Kaiser, May 2003).

While we will focus primarily on the price comparisons between the United

States and Canada, similar comparisons can be pointed to with regard to Mexico and Europe. Tables 1 illustrates the significant differences that exist between prices charges in the U.S. and Canadian drugs. We gathered U.S. and Canadian prescription drug prices from two readily available online pharmacies (Canadian drug prices: <http://www.rx1.biz/index.htm>; U.S. drug prices: <http://www.drugstore.com>). While different web pharmacies offered slightly different prices and delivery services, the differences within the countries were trivial relative to the differences between the countries. These drugs account for approximately half of the prescription drugs sales in the United States and were the only ones for which publicly available data exists on U.S. prices, Canadian prices, and U.S. sales. The sales weighted ratio of Canadian prices to U.S. prices for these drugs is .628, slightly more than the .60 that Guell (1995, 1998) reported for U.K. to U.S. prices.¹

Canadian Prices and U.S. Law

There have been many proposals to ease the financial burden experienced by Americans with regard to prescription drug prices though few have gotten more than cursory attention in Congress. The 2003 changes to Medicare offer a modest insurance plan for prescription drug coverage but suggest no means by which to curtail their increase; moreover it expressly forbids Medicare from using its own market power as the single leading buyer of

¹ Because the price control mechanisms in Canada are different that the price control mechanisms in U.K. we can not conclude that the difference in drug prices is shrinking.

prescription drugs to negotiate lower prices.

What many had been looking for in the Medicare bill was a re-importation provision what would direct the Food and Drug Administration to allow Canadian pharmacies to sell in the U.S. Under current U.S. law, re-importation can only happen if the Secretary of the Department of Health and Human Services certifies that it would be done in a safe manner that would not result in health risks and would lead to a significant drop in drug costs. Neither President Clinton's nor President Bush's Secretary of Health and Human Services would so certify.

While many consider this a cynical payoff to the pharmaceutical industry for their campaign contributions, there are legitimate arguments for disallowing re-importation. The safety question is somewhat specious in that these are quite literally the same drugs in the same packages. Many were produced in the U.S. for the combined U.S.-Canadian market. The real safety concern would be with drug interactions that a local pharmacy may catch that an online pharmacy would not.²

In any event, Canadian pharmacies currently purchase prescription drugs from American pharmaceutical manufacturers at much lower prices than do American pharmacies. In part this is due to the system of price controls that exist in Canada. These pharmacies can then sell the drugs at a much lower

price than pharmacies in the U.S. while still maintaining a profit.

The more substantial argument against allowing re-importation, and the one supported by many pharmaceutical economists, is that price controls would create dynamic inefficiency by deterring research and investment into new drugs. The United States pharmaceutical industry invests far more money and time into the development of new prescription drugs than any other country (Scherer 2001). Add that to the fact that European research dollars are invested in hopes of tapping into high potential profits emanating from U.S. markets. As a result any form of control would contribute to a reduction in profits to the inventing companies thereby decreasing rates of return and diminishing research and development.

Stated simply, re-importation of drugs from Canada would effectively impose Canadian price controls on U.S. markets. We would enjoy the benefits of lower prices and greater availability thereby reducing static inefficiency. We would also reduce future investment causing dynamic inefficiency (Guell 1995).

Price Discrimination and Using The Canadian Price as a Proxy for Marginal Cost

Economists are quite familiar with the notion of price discrimination where consumers are charged for a good based on their ability and desire to pay for the good rather than charging an equal price to everyone. Price discrimination only works if a buyer (who pays little) can not easily resell what they have

² This would apply to U.S. based online pharmacies as well.

purchased to someone else facing a higher price. The pharmaceutical industry is a classic example of market in which price discrimination functions because it is against the law in many nations to re-import drugs for resale. In this way, a U.S. manufacturer can charge Canadian pharmacies a lower price than they charge U.S. pharmacies and not have to worry that a significant number of U.S. consumers will be able to buy their drugs from the Canadian pharmacy. The only U.S. consumers that can legally avoid paying the high U.S. prices are those who live within driving distance of Canada (or Mexico.)

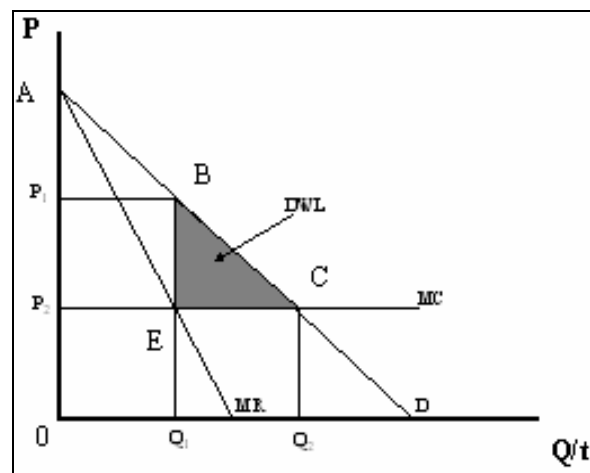
Sometimes there is no foreign law requiring that a U.S. manufacturer sell their drugs at lower prices. They do it because it is in their own financial interest because lower foreign income, lowers foreign demand for drugs and (taken in isolation) the company can generate great profits by selling at lower prices. In any event, either because U.S. firms choose to the price of Canada-bound drugs or have it set for them by the Canadian drug price control mechanism, they sell their drugs there voluntarily. This price can then be taken as an upper-bound estimate of the marginal production cost of the drug. (Guell, 1995)

Dead Weight Loss Calculations

Economists measure the loss to society, or static inefficiency, from a good being over-priced or under-priced with the concept of dead weight loss. Conceptually dead weight loss is the difference between the maximum net gain to consumers and producers and the actual net gain to consumers and producers.

Referring to Figure 1 below, if the marginal cost is constant (at the Canadian price, P_2) and the market were in perfect competition the consumer surplus would be the difference between what consumer would pay for the good ($OACQ_2$) and what they have to pay (OP_2CQ_2). Similarly producer surplus is the difference between what firms receive for their goods (OP_2CQ_2) and their costs which are represented by the area

Figure 1.



under the MC curve (also OP_2CQ_2) (see Figure 1). The combined area of consumer and producer surplus is P_2AC . If the firm is a monopolist then they set quantity, Q_1 , such that the marginal cost equals the marginal revenue and price accordingly, P_2 . The consumer surplus drops to P_1AB . Producer surplus rises to P_2P_1BE but the combined area falls by EBC : the deadweight loss.

Regardless of the control structure, by international agreement drug manufacturers maintain their patent right to be the monopoly seller of drugs in Canada. It is axiomatic to economists that monopolists would not sell their wares

Table 1
*Canadian and U.S. Prescription Drug Prices,
 U.S. Sales, and Estimates of Dead Weight Loss*

Drug	Treatment For	U.S. Price	Canada Price	Percent Difference in Prices	Sales in Millions	DWL as % of Sales
Biaxin*	Skin Infection	214.98	78.00	63.72	537	55.95
Celebrex	Arthritis	74.99	47.38	36.82	2619	10.73
Celexa	Depression	66.99	47.87	28.54	1587	5.70
Claritin*	Allergies	48.31	15.75	67.40	2716	69.67
Cordarone	Heart Ahythmia	373.83	119.95	67.91	265	71.87
Detrol*	Overactive Bladder	89.99	55.65	38.16	488	11.77
Effexor*	Depression	49.99	42.84	14.30	1098	1.19
Evista*	Osteoporosis	70.99	52.88	25.51	526	4.37
Flomax*	Enlarged Prostate	53.19	29.44	44.65	411	18.01
Floxin*	Pelvic Inflammatory Disease	60.92	27.63	54.65	993	32.92
Fosamax	Osteoporosis	68.99	51.04	26.02	1614	4.58
Glucophage*	Diabetes	46.99	13.76	70.72	2655	85.39
Lipitor	Cholesterol	62.99	57.01	9.49	6088	5.00
Nasonex*	Allergies	63.99	28.35	55.70	750	35.01
Neurontin	Neuropathic Pain	45.99	44.71	2.78	2018	0.04
Nexium	Heartburn	120.99	72.50	40.08	1948	13.40
Paxil	Depression	74.99	55.85	25.52	2341	4.37
Plavix	Heart Attack Prevention	107.99	80.00	25.92	1611	4.53
Pravachol	Heart Attack Prevention	79.99	54.64	31.69	1766	7.35
Premarin*	Menopause	21.99	6.30	71.35	1796	88.85
Prevacid	Acid Reflux	120.99	68.03	43.77	3658	17.04
Prilosec	Acid Reflux	89.00	62.10	30.22	3537	6.55
Prinivil	High Blood Pressure	33.99	7.56	77.76	1165	135.92
Protonix*	Erosive Esophagitis	98.99	59.62	39.77	561	13.13
Prozac*	Depression	102.53	55.13	46.23	1659	19.87
Risperdal	Antipsychotic	80.33	25.28	68.53	1805	74.62
Singulair*	Allergies	81.99	52.50	35.97	1060	10.10
Synthroid*	Thyroid Disease	10.99	4.27	61.15	445	48.12
Tricor	Cholesterol	84.99	48.30	43.17	264	16.40
Vioxx	Arthritis	78.99	47.39	40.01	1848	13.34
Xalatan*	Glaucoma	50.99	34.65	32.05	391	7.56
Zithromax*	Bacteria	110.25	66.99	39.24	1137	12.67
Zocor	Cholesterol	51.99	37.77	27.35	4173	5.15
Zoloft	Depression	69.99	35.05	49.92	2644	24.88
Zyprexa	Schizophrenia	147.99	60.07	59.41	2886	43.48

* denotes 2001 annual sales data; all others are 2002

Sources: 2001 U.S. sales data- Centers for Medicare and Medicaid Services, 2002 U.S. sales data- pharmacytimes.com, Canadian drug prices- <http://www.rx1.biz/index.htm>, U.S. drug prices- <http://www.drugstore.com/>.

beyond the point where demand is unit elastic. As a result we can also assume that the elasticity of demand is no less than unit elastic. Looking back to Figure 1 this implies that $P_1Q_1 \geq P_2Q_2$. As per Guell (1995, see the mathematical appendix), with this assumption in place the rest of the math to calculate dead weight loss relies only on total sales and the ratio of the Canadian price to the U.S. price.

Results

The dead weight loss per dollar of sales estimates closely resemble the results from analysis performed using European price data (Guell, 1995, 1998). In terms of dead weight loss, no systematic differences exist between those drugs treating serious illnesses (heart disease, cholesterol, etc.) and those treating less serious afflictions (allergies, heartburn, etc.). What does appear is that those maladies with more alternative treatments (such as depression) have relative low levels of dead weight loss per dollar of sales. Nevertheless, the sheer level of static inefficiency (\$15 billion) and in particular that it is one-third of the sales of these drugs (\$60 billion) makes clear that the dynamic efficiency that comes with high profits also comes at a very high price (in static inefficiency.)

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