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Effects of 'authorized generics' on Canadian drug prices

Paul Grootendorst

SEDAP Research Paper No. 201

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Requests for further information may be addressed to:
Secretary, SEDAP Research Program
Kenneth Taylor Hall, Room 426
McMaster University
Hamilton, Ontario, Canada
L8S 4M4
FAX: 905 521 8232
e-mail: sedap@mcmaster.ca

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Effects of ‘authorized-generics’ on Canadian drug prices*

Paul Grootendorst
Associate Professor
Leslie Dan Faculty of Pharmacy
University of Toronto

paul.grootendorst@utoronto.ca
416 946 3994

Abstract

This paper examines how the use of ‘authorized-generics’ (AGs) influences Canadian prescription drug prices. An authorized-generic is the actual brand name drug product, manufactured by the brand firm, but sold as a generic by a licensee or subsidiary of the brand, competing with independent generics (IGs), which operate independently from the brand firm. In theory, AGs have offsetting effects on drug prices. On the one hand, AGs compete against IGs and increases in the number of generic competitors should lower prices. On the other hand, the threat of AG entry into a therapeutic market might deter entry by IGs and this would lessen competition. Moreover, brand firms might increase prices of their brand drugs to increase demand for their AG. I find that when AGs are first to enter a drug market, average drug prices drop by about 12%; average prices drop by smaller amounts, the larger the AG share of the generic market. I could not directly assess whether the threat of AG entry into a market might deter entry by IGs. IG executives, however, state that the threat of AG entry has decreased their incentive to challenge ‘marginal’ drug markets. In particular the threat of AG entry has increased from \$5m to \$10m the threshold market size – the value of brand drug sales in the 10th year that it has been on the market, below which the IG firm will not attempt to enter. IG executives also stated that AGs have seriously reduced IG retained earnings. The reduction in retained earnings has hampered their ability to challenge brand drugs with annual sales well above \$10m, but which have particularly high entry costs. Finally, the IG executives claimed that brand firms have attempted to use the threat of AG entry to negotiate agreements with the IG to delay entry (or not enter at all). A comprehensive evaluation of the competitive effects of AGs would need to verify and quantify these costs and compare these to the benefits of AG competition.

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Keywords: authorized-generic drugs, independent generic drugs, drug prices, Canada

JEL Classifications: I11, I18, L65

Résumé

Cette étude se penche sur les effets de l'usage de médicaments « génériques autorisés » (GAs) sur le prix des prescriptions canadiennes. Un GA est un produit de marque original vendu comme un médicament générique par un tiers parti autorisé ou une filiale de la marque, rentrant en concurrence avec les produits génériques indépendants (GIs), et qui opère ainsi indépendamment de la compagnie mère. En théorie, les GAs ont des effets compensateurs sur le prix des prescriptions. D'un côté, les GAs rentrent en concurrence avec les GIs et la hausse du nombre de producteurs de médicaments génériques devrait entraîner une diminution des prix. D'un autre côté, la menace liée à l'introduction des GAs sur le marché thérapeutique pourrait décourager l'entrée de nouveaux GIs, et provoquer une baisse de la concurrence. De plus, les marques pourraient augmenter les prix de leurs médicaments originaux afin d'augmenter la demande des GAs. Nous trouvons qu'à la suite de l'introduction des AGs sur le marché, le prix moyens des médicaments diminuent de 12%; mais ces derniers diminuent plus modérément selon l'importance de la part de marché des GAs sur le marché des médicaments génériques. Nous n'avons pas été capable de déterminer directement si la menace posée par l'introduction des GAs sur un marché décourageait l'entrée de nouveaux GIs. Les cadres de compagnies de GIs, cependant, affirment que la menace de voir apparaître des GAs a diminué volonté de rentrer sur des marchés de médicaments plus marginaux. En particulier, l'apparition des GAs a entraîné une hausse de \$5m à \$10m du seuil critique de taille du marché – la valeur des ventes d'un médicament de marque durant la dixième année de sa mise en marché, seuil en dessous duquel une compagnie de GI ne tentera pas de pénétrer le marché. Les cadres des compagnies de GIs ont aussi souligné que les GAs ont sérieusement réduit leurs bénéfices non distribués. Cette réduction des revenus stables a entravé leur aptitude à compétitionner avec les médicaments de marque dont les ventes sont supérieures à \$10m, mais dont les coûts d'introduction sont particulièrement élevés. Enfin, les cadres des compagnies de GIs soutiennent que les compagnies de marque ont tenté d'utiliser la menace d'introduire des GAs pour négocier des délais (ou des retraits) d'introduction avec les GIs. Une évaluation complète des effets compétitifs des GAs devrait vérifier et quantifier ces coûts et les comparer aux bénéfices de la concurrence émanant des GAs.

Introduction

This paper examines how the use of ‘authorized-generics’ influences Canadian prescription drug prices. An authorized-generic (hereafter ‘AG’)¹ is “the actual brand name drug product, manufactured by the brand company, but sold as a generic by a licensee or subsidiary of the brand, competing with independent generics.” (Hollis and Liang, 2006) AGs are to be distinguished from independent generics (hereafter ‘IG’s) which operate independently from the brand firm.

Theoretically, AGs have offsetting effects on drug prices. On the one hand, AGs compete against IGs and as I discuss below, increases in the number of generic competitors should lower prices. On the other hand, as Hollis (2003) and Kong and Selden (2004) have noted, the threat of AG entry into a therapeutic market might deter entry by IGs and this would lessen competition. Moreover, brand firms might increase prices of their brand drugs to increase demand for their AG if there are no IGs available.

Why might the threat of AG entry deter entry by an IG? According to Hollis (2002), the reason is that the AG, should it be the first generic to enter a market, typically captures a significant and durable market share. This reduces the demand for the IG and may make entry into marginally profitable therapeutic markets unprofitable. One would therefore expect that the threat of AG entry might deter IG entry in markets with only modest revenue potential.

Generic drug competition in the Canadian drug market

How does generic drug competition lower drug prices? In a conventional market, increases in the number of suppliers reduce the average price paid by consumers – suppliers lower prices in an attempt to gain market share. In the limiting case, known as a perfectly competitive market (one with very many buyers and sellers of a homogenous product), price will decline to the marginal production cost. The Canadian market for generic prescription drugs is different. First, two generic companies, Apotex and Novopharm, control over half of the market (Skinner 2004). Second, although there are many consumers in this market, including private insurance plans and cash paying customers, the market is dominated by several large provincial government drug plans, notably the plans operating in Ontario (the Ontario Drug Benefit program) and Quebec (RAMQ) that cover the drug costs incurred by seniors, those with high drug costs relative to income, and other groups. The ODB plan is the single largest drug plan in Canada; it dictates the amount that it is willing to pay for generic drugs, and these prices become the *defacto* prices charged to other customers.

The amount that is ODB willing to pay for generic drugs is a proportion of brand drug prices. During the period May 1993 – September 1998, ODB invoked the ‘75/90’ regulations. The 75/90 regulations stipulated that the first generic entrants’ price could not exceed 75% of the incumbent branded drug price. When the second generic entered the market, the maximum reimbursement price dropped to 67.5% of the branded drug price (i.e. 75% of the first generic entrants price: 75% of 90%=67.5%). During the period November 1998 – September 2006,

¹ Authorized-generics are sometimes referred to as ‘pseudo-generics’.

ODB limited the first generic entrants' price to 70% of the incumbent branded drug price. When the second generic entered the market, the maximum reimbursement price dropped to 63% of the branded drug price (i.e. 70% of the first generic entrants price: 70% of 90%=63%). Since October 2006, the ODB reimbursement of generic drugs is limited to 50% of the brand drug price. The ODB, however, will consider a increasing the reimbursement of the first generic entrant by up to 70%, on a case-by-case basis.

Anis et al (2003) present evidence that generic prices in Ontario are set close to the ODB maximum generic drug reimbursement prices. The prices charged for generic drugs in other provinces tend to match ODB prices. Generic firms that attempt to charge more would soon be undercut by wholesalers who sell drugs at ODB prices.

How then do generic firms compete for market share? Once they become available for sale, generic drugs rapidly replace branded drugs owing to the reimbursement policies of almost all drug plans, public and private alike. Most plans limit reimbursement of multi-sourced drugs (i.e. drugs for which there are both brand and generic forms available for sale) to the price of the generic drug.² Drug plan beneficiaries do have the option of paying extra to get the higher priced brand version of the drug, but relatively few are willing to pay extra. The first generic therefore gains a large market share and can charge 70% of the branded drug price. Once there are several generics available, generic firms compete for sales to large pharmacy chains such as the Shoppers Drug Mart chain and independent pharmacies by lowering prices charged to these pharmacies. Competition occurs through the generosity of cash and in-kind rebates; these rebates drive down the effective price paid by the pharmacy for generic drugs. The difference between the ODB reimbursement price and the pharmacy's actual acquisition cost becomes part of the pharmacy's revenues. Anecdotal evidence suggests that this margin can be as high as 60% of the formulary price of generic drugs. Anis (1992) reports that when the Nova Scotia public drug plan replaced formulary pricing with a system in which only the actual acquisition costs were reimbursed, generic drug prices fell by about 40%.

The rebate system was disrupted by regulations enacted by ODB in October 2006. In an attempt to manage program costs, ODB appropriated some of the rebate amounts that were accruing to pharmacy chains. It did so by reducing the maximum that it would reimburse generic drugs to 50% of the brand drug price and limiting the rebate amounts generic firms paid to pharmacies for ODB-reimbursed drugs to 20% of the ODB reimbursement price.³ Although ODB did not regulate rebates paid for drugs that it did not reimburse, it applied a code of conduct that required that *all* generic drug rebates that Ontario pharmacies received (from sales of generic drugs to both ODB and private payers) be used for patient care. Rebates could no longer be taken as

² The Quebec RAMQ plan is notable for its willingness to pay for the brand version of the drug for 15 years (from the date of formulary inclusion of the brand drug) even if generic versions are available for sale.

³ To offset these revenue losses, the Ontario government increased the dispensing fee (from \$6.46 to \$7.00 per prescription) and, in recognition of professional services traditionally rendered by community pharmacists without payment, established new funding (cited to be in the area of \$50 million for 2006-07) as compensation for these services. Further details on the legislation are available at:

http://www.health.gov.on.ca/english/public/legislation/drugs/hu_drugsact.html

personal income. These regulations appear to be actively enforced: ODB just recently announced that each Ontario pharmacy is required to submit quarterly reports on the amount of rebate revenue received and how these revenues are used.

It is unclear how these regulations will affect the prices received by generic firms. On the one hand, the maximum rebate that can be paid on ODB prescriptions is limited to 20% of the ODB price – limiting the rebates should increase prices received by generics. On the other hand, this limit does not apply to non-ODB prescriptions, so that generics might still use rebates to compete for this segment of the Ontario market, as well as the rest of the domestic market. Moreover, the maximum generic price is now 50% of the brand price (although as stated earlier, it is possible that the first generic entrant might be able to negotiate a higher amount). It seems likely that this new, lower generic price will be available to the rest of the domestic market, although pharmacy chains are actively resisting this at present.

Why might a brand firm introduce an AG?

Under the terms of the ‘NOC-link’ section of the Patent Act, IG firms must declare to the brand firm their intention of introducing a generic copy onto the market.⁴ This declaration, and any resulting litigation over the validity of brand firm’s patents, gives the brand firm some indication of the timing of IGs onto the market. If no IG is expected to enter, then neither will the AG. If it appears that IG entry is likely, then the brand firm may launch an AG, for two reasons.

First, launching an AG might be profitable. Relative to IG firms, the brand firm faces low fixed market entry costs. Because the AG *is* the brand drug, the brand firm does not face the costs of conducting bioequivalence studies,⁵ nor does it face the costs of challenging the validity of any outstanding patents. Also, the costs of establishing manufacturing capacity have already been incurred at the time of the brand drug launch. The brand firm must pay a fee for the licensee to sell the AG drug, but these costs would likely be less than the fixed costs incurred by IG firms.

Should it decide to enter a market, the brand firm is faced with the decision of launching its AG before the IG drug, or not. By launching before the IG, the AG initially captures the entire share of the generics market. Moreover, if it is the only generic available on the market, it need not pay pharmacies any rebate (since the pharmacy has no choice but to carry it) and this will increase net reimbursement. These benefits may be short lived however – as the number of generic competitors increase, the AG’s market share will decrease and the amount of rebate needed to gain access to pharmacy shelves increases.⁶ More importantly, by launching before

⁴ IG firms must declare using a ‘Notice of Allegation’ or NOA that their generic drug will not infringe any of the brand firm’s patents but this has the effect of signaling their intentions to enter a therapeutic market. A brand firm can delay the regulatory approval of the generic drug (technically the issuance by Health Canada of a Notice of Compliance, or NOC, indicating that the drug is bioequivalent to the brand drug) by alleging patent infringement.

⁵ Health Canada requires evidence that IGs are bio-equivalent with the brand drug and also have acceptable potency, purity, and stability. Hollis (2005) cites a newspaper article that indicates that these development and clinical testing costs typically range from \$0.5 m to \$3 m per drug.

⁶ One way that a major IG firm is reported to have gained AG’s market share is to purchase from pharmacies the AG’s inventory, replacing it with their own product.

the IG, it will cannibalize its brand drug sales. Specifically, during the period November 1998 – September 2006, the AG realized only 70% of the price paid for the brand version of the drug. Accepting a 30% price cut (and after the recent changes to ODB reimbursement, up to a 50% price cut) makes sense only if the AG realizes a compensatory increase in market share relative to the share it would realize if it launched alongside (or after) the IG.

Launching an AG before the IG could increase profits for another reason. If the AG is the only generic on the market then the brand firm could potentially coordinate the prices charged for the brand and AG forms of the drug in a way that maximizes profits. In particular, as Hollis (2005) notes, by pricing the brand version relatively high, it can increase the amount that it charges for the AG version of the drug, subject to price regulations imposed by the federal government and provincial drug plans.

The second reason that the brand firm might find it in their interest to launch an AG is to establish a reputation among IGs that it will launch an AG in ‘marginally profitable’ markets – markets in which the presence of the AG can tip the balance between economic profitability and loss. This might deter future IG entry in such markets.

Existing Evidence

In theory, the impact of AGs on drug prices is ambiguous. What does the evidence indicate? There is no empirical evidence on the effects of AGs on the decision by an IG to attempt to enter a drug market. The evidence on the effect of AGs on drug markets in which IGs do enter is mixed. The one Canadian study (Hollis, 2005) found AGs to be mildly anti-competitive. Hollis analyzed sales data for the 31 drugs in Canada for which the first generic competitor entered during the years 1994-1997. He concludes:

“This paper shows that pseudogenerics appear to increase both brand and generic drug prices, in line with a simple theoretical model. ... The econometric analysis shows that a 10% increase in the pseudogeneric share of generic sales leads to brand prices about 1% higher, controlling for the number of generics and the years since the first generic entered. Since the typical pseudo-generic controls about 40% of generic sales in the first few years of generic entry, this implies about a 4% increase in brand prices, compared to the case of no pseudo-generic. The direct impact of pseudo-generics on generic drug prices appears to be similar in scale.” Page 348.

The US evidence is mixed. The Pharmaceutical Research and Manufacturers of America (PhRMA), the association of US brand drug firms, commissioned IMS Consulting to assess the effects of AGs on US generic prices. The study⁷ found that AGs were pro-competitive. Specifically the study compared markets with and without AGs present and found that average

⁷ The study is available at:

http://www.phrma.org/files/IMS%20Authorized%20Generics%20Report_6-22-06.pdf [accessed Nov. 23, 2006] See also:

http://www.phrma.org/news_room/press_releases/phrma_statement_on_authorized_generics/

generic prices (measured as a fraction of the brand drug price) were lower— on average 15.8 percentage points lower – in markets with AGs present.

In response, the Generic Pharmaceutical Research and Manufacturers of America (GPhRMA), the association of US independent generic firms, commissioned Hollis and Liang to evaluate the PhRMA study methods. The study, which will appear in Hollis and Liang (2006), challenged both the measurement of the price variables in the PhRMA study as well as the methods used to identify the impact of AGs on price. For instance, Hollis and Liang suggested that the PhRMA study finding of greater percentage discounts to brand prices in markets with AGs is due in part to higher brand prices in markets with AGs, rather than lower generic prices. In other words, during the period immediately following IG entry, prices of the brand drug increased more in markets with AGs than in markets without AGs. They also question whether the influence of AGs on prices can be captured with a simple comparison of markets with and without AGs present. In particular, they note that these market likely also differ with respect to sales volume, number of anticipated entrants, potential for licensing and other factors that could independently affect price discounts. Finally, Hollis and Liang note that the PhRMA study does not address the effects of potential AG entry on the likelihood that an IG will attempt to enter a market.

When they reanalyzed the data used in the PhRMA study, Hollis and Liang found some evidence of a very modest anti-competitive effect. Specifically, in markets with AGs present, the average discount of generics off of branded prices was less than in markets without an AG (17.7% vs. 17.1%).

Research Objectives

Industry Canada and the Competition Bureau asked me to investigate the following questions about the prevalence and effects of AGs in Canadian pharmaceutical drug markets:

1. In what proportion of drug markets are authorized generics present?
2. How important is the invocation of the automatic 24 month stay under the PM(NOC) Regulations in determining the entry of authorized generics?
3. What are the characteristics of the drug markets that authorized generics enter? In particular, how important is market size in explaining authorized generic entry?
4. What is the impact of authorized generics on drug prices and the entry of independent generics?
5. How important are market opportunities in the U.S. at explaining the decisions of independent generic firms to enter a particular market?

Methods

Questions (ii) and (v) were addressed using qualitative methods – I interviewed executives of major brand and generic firms as well as representatives of the IG trade association, the Canadian Generic Pharmaceutical Association (CGPA).

The remaining questions were addressed by analysing IMS Health Canada data on the national, monthly sales of the generic and brand versions of all dosage forms and strengths of the molecules in which the first generic drug (authorized or independent) launched over the period 1998-2004. I identified the AG drugs using the NOC database produced by Health Canada.⁸ Specifically AG drugs were identified as those generic drugs which have received New Drug Submission (NDS) status; independent generics have Abbreviated New Drug Submission (ANDS) status.⁹ Not all NDS status generic drugs are AGs, however. I consulted with IMS Health Canada, Jack Kay of Apotex and Brogan Inc to help identify the NDS drugs that were not AGs.

Using these data, I determined the proportion of drug markets in which an AG has entered (question (i)); estimated regression models of the probability of AG entry in the molecule market (question (iii)); and finally estimated regression models of the average price for the molecule as a function of the presence of an AG (question (iv)).

The probability of AG entry was modelled to be a function of *inter alia* an estimate of the expected total sales revenue for all dosage forms and strengths of the molecule in the year before the launch of the first generic; indicators of year of first generic launch; and finally indicators of the company producing the brand drug.

I describe the methods to estimate the influence of AGs on drug prices below.

Results

1. In what proportion of drug markets are authorized generics present?

I defined a drug market as a unique combination of molecule and dosage form; hence I distinguished, for instance, the oral solid version of cyclosporine from its oral liquid and its injectable forms. I distinguished between the different dosage forms of the same molecule because in some cases the pattern of generic drug entry varied by dosage form. In the case of cyclosporine, for instance, an AG (but not an IG) launched an oral solid, while an IG (but not an AG) launched an oral liquid. Neither an AG nor an IG launched an injectable form. Of the 83 drugs in the sample, however, most were oral solids (tablets and capsules) that were not available in other dosage forms.

Table 1 provides a cross-tabulation of IG and AG entry into the 83 drug markets. An AG entered 32 (39%) of the 83 drug markets in the sample, while an IG entered 74 of the 83 markets.

⁸ <http://www.nocdatabase.ca/>

⁹ According to Jack Kay, COO of Apotex, an AG drug would not cite any bioequivalence data on its product monograph, whereas an IG would. Unfortunately, I could not locate the product monographs of the generic drugs in this study.

Both an IG and an AG entered in 31 markets. The 39% AG entry rate over this time period is consistent with Hollis' (2005) finding: "In 1999, the total pharmacy sales of these generics drugs totaled approximately \$500m, of which the pseudo-generic share was 34.6%." (p. 332)

Table 1: Cross tabulation of AG and IG entry in 83 drug markets

=1 if authorized generic launched	=1 if independent generic launched		Total
	0	1	
0	8 15.69 88.89	43 84.31 58.11	51 100.00 61.45
1	1 3.13 11.11	31 96.88 41.89	32 100.00 38.55
Total	9 10.84 100.00	74 89.16 100.00	83 100.00 100.00

Note: first number in each cell is the frequency, second number is the row percentage and the third number is the column percentage.

Table 2 provides information on the timing of the AG and first IG in the same market. Of the 31 markets in which both an AG and an IG entered, the IG entered first in 16, the AG entered first in 10 and they both entered in the same month in 5 markets.

Table 2: Number of Months by which AG Precedes IG

Number of Months by which AG Precedes IG			
	Freq.	Percent	Cum.
-39	1	3.23	3.23
-27	1	3.23	6.45
-25	1	3.23	9.68
-21	1	3.23	12.9
-18	1	3.23	16.13
-12	1	3.23	19.35
-6	1	3.23	22.58
-5	1	3.23	25.81
-4	1	3.23	29.03
-3	1	3.23	32.26
-2	2	6.45	38.71
-1	4	12.9	51.61
0	5	16.13	67.74
1	3	9.68	77.42

Number of Months by which AG Precedes IG	Freq.	Percent	Cum.
2	3	9.68	87.1
3	1	3.23	90.32
8	3	9.68	100
Total	31	100	

Note: a positive number means that the AG entered before the IG.

Figure 1 plots data on the number of months by which AG entry precedes IG entry, by the total sales of the drug in 1998. There is some evidence that in small to medium markets (markets with sales of \$50 M or less), the AG is no more likely than the IG to enter first. In the 4 largest markets, however, the AG comes in no later than the IG.

Figure 1: Number of Months by which AG Precedes IG, by 1998 market sales

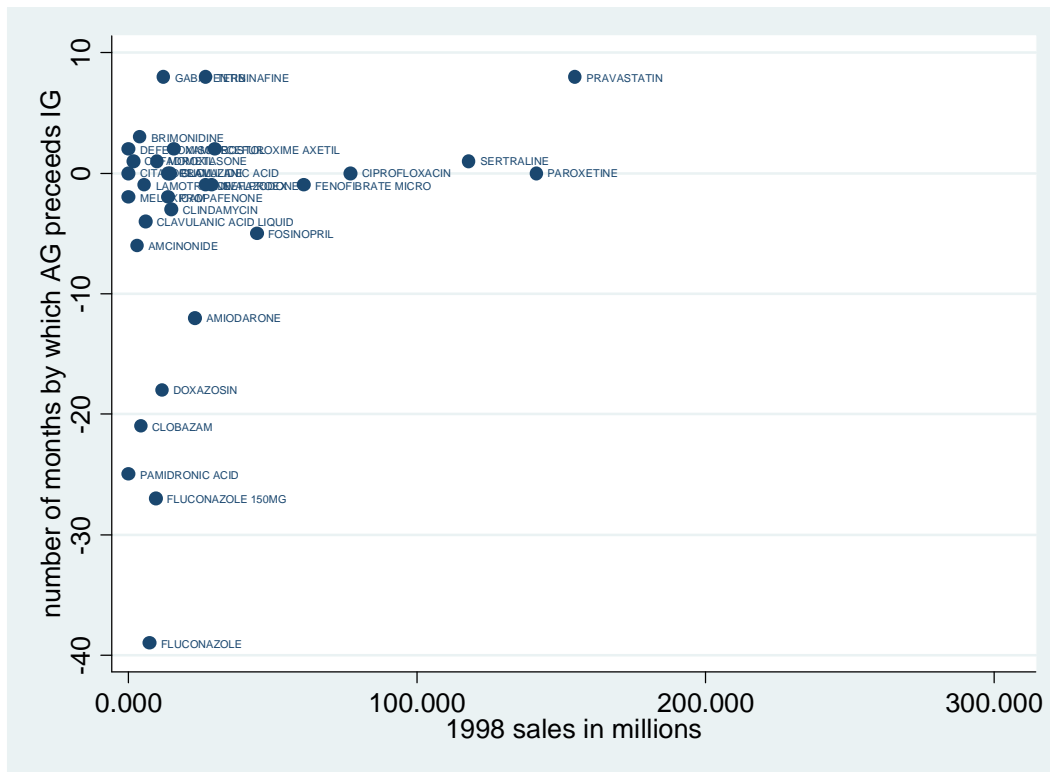


Table 3 presents summary data on the fraction of markets with AGs and IGs present, by the total sales of the drug in 1998. The fraction of markets with an AG or IG tends to increase with the value of 1998 sales of the drug.

Table 3: Fraction of drug markets with authorized generics and independent generics present, by quintiles of total sales of the drug in 1998 (\$millions)

Quintile	Mean	Median	Min	Max	% with AGs	% with IGs
1	0.00	0.00	0.00	0.00	19%	77%
2	0.91	0.84	0.33	1.74	13%	63%
3	4.55	4.52	2.58	7.26	31%	100%
4	12.80	13.63	7.33	20.39	59%	100%
5	83.69	45.84	23.07	308.62	69%	100%

Appendix 1 presents detailed information on IG and AG entry into the 83 markets, as well as year specific sales in these markets.

2. How important is the invocation of the automatic 24 month stay under the PM(NOC) Regulations in determining the entry of authorized generics?

My sense from the literature and discussions with industry representatives is that the PM(NOC) (hereafter the “NOC link”) regulations facilitate the entry of AGs, although they are not absolutely necessary. A brand firm will normally not launch an AG unless it is confident that an IG will indeed enter. Under the NOC link regulations, the brand firm can more accurately ascertain the date of expected entry of an IG into a therapeutic market than it could without the NOC link regulations. The reason is that under the NOC link regulations, an IG firm is obliged to notify the brand firm of its intention to enter. The NOC link regulations also give the brand firm the right to delay the issuance of an NOC by alleging patent infringement. The ensuing litigation provides the brand firm with much more information on the entry date than it would otherwise have. For instance, the brand firm can monitor the progress of the trial and hence forecast its outcome, providing it with information with which it can determine whether and when it should ready an AG.

Without the NOC link regulations, conversely, the only information that the brand firm would have about IG entry is the expiration date of its patents, and Health Canada NOC approval of an IG drug.

It is important, however, not to overstate the importance of the NOC link regulations in informing the brand firm of the expected market entry date of an IG. First, my data indicates that brand firms do not always attempt to beat IG firms to the market with an AG, especially in markets with only modest revenue potential. In larger markets however, the AG enters at the same time or some months before the IG. Second, my brand firm contacts mentioned that even if they were notified of the imminent entry of an IG by some other means (say the issuance by Health Canada of an NOC) they could still launch an AG about the same time as an IG. The reason is that an IG will usually achieve significant sales volumes only some time after it receives its NOC. In particular, it takes some time for the provincial drug plans to list the IG on its formulary (which is the point in time at which demand for the drug increases markedly). Moreover, AGs might also be able to launch faster than IGs. According to the CGPA, several

provincial government drug plans – including the plans operating in Alberta and Newfoundland – require generics to submit evidence of bioequivalence before they will reimburse the generic drug. (The other plans accept Health Canada certification of bioequivalence.) Vetting the bioequivalence data for an IG takes longer than that for an AG (since the AG *is* the brand drug, bioequivalence is a non-issue). Depending on the frequency with which the assessment committees meet and make their recommendations re: bioequivalence, and the frequency with which these recommendations are acted upon by formulary committees, the AG might get listed on a provincial formulary before an IG.¹⁰

3. What are the characteristics of the drug markets that authorized generics enter? In particular, how important is market size in explaining authorized generic entry?

I estimated a probit regression model of the probability of AG entry into the drug markets. The probability was modelled as a function of: (i) indicators of the brand drug firm (in the event that different brand firms are more or less likely to use AGs); (ii) indicators of the year of entry of the first generic (authorized or independent); as well as (iii) indicators of the quintiles of market sales in the 12 month period prior to generic entry. These quintiles divide the drug markets into 5 evenly sized groups, ranked by sales from smallest to largest. The markets in the bottom quintile had annual sales of between \$0.01 and \$1.73 million; the markets in the top quintile had annual sales of between \$50.8 and \$485 million (Table 4).

Table 4: Mean, median, min and max total sales (\$million) in drug market in the year before generic entry, by sales quintile

Quintile	Mean	Median	Min	Max
1	0.73	0.73	0.01	1.73
2	4.75	4.94	1.76	7.11
3	14.02	14.78	7.21	18.55
4	25.92	25.46	20.07	35.90
5	161.99	121.27	50.84	485.20

The model estimates indicate that of the three factors considered above, factor (iii), market size, is the strongest predictor of AG entry. Holding constant the influence of factors (i) and (ii), the

¹⁰ An IG executive I interviewed recounted how their launch of ramipril was pre-empted by an AG: “We got our NOC on Dec 12, after years of litigation, and sent our submission to Alberta by courier on Dec.13. It arrived Dec 14. Sanofi-Aventis arranged for a NOC for authorized generic to be issued to ratiopharm on Dec 13. Because they did not have to file a substantive submission in Alberta but are automatically accepted because same as brand, Alberta considered their submission complete on Dec 13. Our submission had to include data and was very large, and thus could not be transmitted by fax. It arrived at Alberta Health on Dec 14 as aforesaid. Alberta fast-tracks the first generic. Hence they proceed to immediately list the ratio product and not ours, and ratio thus took the whole Alberta market. ...”

bigger is the market size, the greater is the likelihood of AG entry. Compared to markets in the lowest sales quintile, AGs were: 33 percentage points more likely to enter markets in the second lowest sales quintile ($p=0.196$), 45 percentage points more likely to enter markets in the middle sales quintile ($p=0.059$), 43 percentage points more likely to enter markets in the second highest sales quintile ($p=0.081$), and 64 percentage points more likely to enter markets in the top sales quintile ($p=0.004$).

A useful summary statistic is the R-squared; this statistic reflects the amount of variation in the outcome variable that is explained by predictor variables. I note that my AG entry probability model pseudo-R-squared is decent (29%) for a cross sectional data set. This likely reflects the strong predictive performance of pre-IG market sales; the remaining explanatory variables had apparently little explanatory power. Specifically, there were no noticeably different probabilities of AG entry among the different brand firms. (Novartis Pharma and Pfizer had slightly higher probabilities of issuing AGs than the other brand firms, but it is not clear if this is a chance result.) Similarly, there were no discernable trends in the likelihood of AG entry by year.

4. What is the impact of authorized generics on drug prices and the entry of independent generics?

Recall that, theoretically, AGs have offsetting effects on drug prices. On the one hand, AGs compete against IGs and increases in the number of generic competitors should lower prices. On the other hand, the brand firm might raise prices on its branded drug to increase the sales revenue accruing to its AG drug. Moreover, the threat of AG entry into a therapeutic market might deter entry by IGs and this would lessen competition.

One therefore needs to assess the net effect of AGs on drug prices. One can do so by considering the effects of AGs on drug prices in drug markets with and without generic drugs present. The impact of AGs on markets with a generic drug (IG or AG) present can inform the impact of AG competition on drug prices, after accounting for the fact that brand firms might increase branded drug prices when an AG is present. I develop and estimate a drug price model that addresses this question. This model uses IMS data on the average prices charged for the drug molecules in which a generic drug entered between 1998 and 2004. This model, however, does not inform the question as to how the threat of AG entry deters IG entry in marginally profitable markets and how the attendant reduction in competition translates into higher prices. The impact of AGs on IG entry is the difference between the likelihood of IG entry with the threat of AG entry present and the likelihood of IG entry without the threat of AG entry. It is difficult to estimate this impact. While data on the drug markets in which IGs have entered is readily available, it is difficult to determine which drug markets IGs would have attempted to enter had it not been for the threat of AG entry. In particular, while we can directly observe the drug markets in which all relevant patents have expired but in which there are no IGs, it is not obvious which patent-protected drug markets would have been successfully challenged by IG firms (perhaps because the patents were sufficiently weak) but were not due to the threat of AG entry. Yet these data are required to address the question.

I explored various approaches to addressing this question. For instance, I investigated whether it was possible to analyze annual data on the threshold market size, above which an IG enters. If

the advent of AG competition in the Canadian market occurred recently then it might be possible to examine time series data on these market size thresholds in period before and after the advent of AG competition. It turns out however that AGs have competed in the Canadian market since at least 1987, making it difficult to collect data in the period before AG competition began.

Instead of conducting a quantitative analysis of AGs on the likelihood of IG entry, I used qualitative methods. Specifically I interviewed executives of a major domestic IG firm about the effect of the threat of AG entry on the threshold market size above which the IG will attempt to enter. I describe the results of these interviews below.

Quantitative analyses

I developed a linear regression model of average prices charged to consumers (i.e. drug insurers, and patients paying out of pocket) each month, in each of the 83 drug markets described in Appendix 1. The average monthly price in each of these markets is simply total monthly sales revenues across all strengths and manufacturers of the drug (including brand and generic firms) divided by the total number of milligrams (mg) of the drug dispensed. The total mgs of the drug dispensed, in turn, is the number of units dispensed times the strength in mgs per unit. I deemed expenditure per mg of drug dispensed to be the best measure of average price charged – it automatically standardizes prices charged consumers for differences in the market shares of the brand and generic products. Importantly, it is sensitive to any increases in brand price that might occur after AG entry. And unlike a price measure based on expenditure per prescription, my measure is sensitive to the number of units dispensed per prescription and the strength per unit.

The IMS sales data are derived from a sample of total prescription drug sales and volumes at over 2000 representative retail pharmacies. The sales data include all wholesale and retail markups and dispensing fees, so that some of my consumer price variable represents payments to wholesalers and pharmacies. Below, I explain how my model will account for the influence of variation in such payments.

I modelled the average drug and month specific price as a function of the following covariates:

- Indicators of various levels of the authorized generic share of the *generic* prescription volume, measured as the total number of mgs dispensed. As Hollis (2005) notes, this variable was thought to better capture the degree of AG market penetration than a simple binary indicator of AG entry. The use of multiple indicators, each indicating the degree of AG penetration (0%, 1-20%, 21-40%, 41-60%, 61-80%, 81-100%) allows for non-linear effects of AG entry on price.^{11 12}

¹¹ Hollis (2005) presents evidence that the AG share of the generic market is endogenous in the price model; i.e. AG share is correlated with an unobserved component of price. He therefore developed an instrumental variables estimator using as an instrument the number of months by which the AG beats the first IG to market. I deal with the possible endogeneity of AG share in my price model by using the one period lagged values of AG share and number of IGs instead of their contemporaneous values.

¹² In some versions of the empirical price models, I distinguished between AGs that are licensed to a subsidiary of the brand firm from the AGs that are licensed to an IG firm, in order to assess

- Indicators of various levels of the number of independent generic competitors
- Drug market specific indicators (included to pick up time-invariant differences in the price per mg of the different molecules; this will also pick up the influence of market size and other time-invariant factors that might affect entry by IG and AG firms)
- Quarter of year indicators (included to pick up time period-specific changes in the price common to all the different drug markets, such as changes in pharmacy and wholesaler mark-ups and fees)

I modelled the effects of AG generic market shares and other predictor variables on the *log* average price per mg. Focussing on log price allowed me to assess the effects of changes in the AG generic market share on relative (percentage) price changes, which is intuitively more appealing than absolute changes in price per mg.¹³

I used all available data, except that I removed observations on nefazadone after it was pulled from the market due to safety concerns in January 2004. Although there were a few price observations available after this date, the average price was very poorly estimated.

I also estimated the price model using the subset of the data which remained after dropping observations on drug markets in which the price and generic market share data were measured with considerable error.¹⁴ Measurement error can decrease the precision of one's model estimates and I wanted to ensure that my results were robust to measurement error.¹⁵ The reader is invited to inspect drug market specific data on monthly average price, average brand drug price, generic drug share of the market, and authorized generic drug share of the market, presented at <http://individual.utoronto.ca/grootendorst/pdf/drugpricegraphs.pdf> to assess the degree of measurement error in these drug markets.

The price models fit the data quite well – R squared values all exceed 95%. (See Appendix 2 for details of the model results.) Moreover, the parameter estimates are plausible. The models suggest, for instance, that increases in the number of independent generic drugs reduce average prices.

whether this distinction makes a difference to the estimated impact of AG generic drug share on average price. The data were not sufficiently informative to detect a difference.

¹³ The log transformed price model is also more consistent with the data than the linear price model: I subjected the average price model to the boxcox transform to determine whether a linear or log specification was more appropriate – the linear specification was handily rejected in favour of the log specification.

¹⁴ Recall that the IMS sales data are estimates based on a representative sample of pharmacies. For some drugs with low prescribing volumes, the price estimates are highly variable. This could be because of the limitations of survey sampling. It could also reflect a limitation with my data. I had to enter manually into my database sales data for the years 1998-2000. (IMS data older than 72 months are available in hardcopy only.) The dollar sales and quantities data in these hardcopies are rounded to the nearest 1000 dollars or units, which can introduce measurement error when the underlying sales volumes are small.

¹⁵ Specifically, I removed the follow drugs: Amiodarone Inj, Cefuroxime Axetil Liquid, Ciprofloxacin Liquid, Clavulanic Acid Liquid, Clindamycin Inj, Clindamycin Liquid, Cyclosporine Inj, Cyclosporine Liquid, Fenofibrate, Fluconazole Inj, Fluconazole Liquid, Ketorolac Inj, Labetalol Inj, Lamotrigine Chewable, Piperacillin, Propofol, Tizanidine, Vancomycin Inj, Warfarin Inj.

The models suggest that AGs are mildly pro-competitive. Focusing on the results in model 1.3, when AGs capture 80-100% of the generic market, that is, when they are the first or among the first to enter the market, they unambiguously reduce prices by about 11%. When the AG generic market share is in the range of 21-80%, prices drop by a smaller degree – between 5 and 7%. When the AG generic market share is in the range of 1-20%, prices drop by an even smaller degree – about 3%. This suggests that the average per mg price of the brand drug increases as IGs take market share away from the AG (otherwise the additional competition provided by IGs would lower average price).

To investigate further, I estimated models of the impact on AG generic market share on the average *brand drug* price per mg. These models suggest that average brand prices are slightly higher (between 2-8%) when AGs control between 1-40% of the generic market compared to when they are not sold at all. (Brand prices are essentially unchanged when AGs control 41-100% of the market.)

Qualitative analyses

The generic firm executive indicated that AGs have their primary anticompetitive effect on the decision of IGs to enter a drug market. He indicated that with AGs present, and under the current set of ODB drug reimbursement regulations, he will not bother challenging a drug market with less than \$10 million in annual sales. He reasoned as follows.

Generics can charge at most 50% of the brand price so that potential revenues drop to \$5 million. Even if his IG firm is the first on the market, he can get at most 75% of the entire market (recall that RAMQ and some private plans will continue to cover brand drugs even with generics available). This reduces revenues to $0.75 \times \$5\text{m} = \3.75m . Under the new ODB regulations, the cost of rebates to pharmacies is about 40% (down from over 50%). Hence revenues net of rebates are $0.6 \times \$3.75\text{m} = \2.25m . Production costs (raw materials, labour and indirect overheads, including depreciation) are roughly 40% of revenues; revenues net of production costs are therefore $0.6 \times \$2.25\text{m} = \1.35m . Selling expenses, including administration, distribution, and the legal costs of challenging patents reduce net revenues by a further 15%; hence $0.85 \times \$1.35\text{m} = \1.15m remains after deducting selling expenses. R&D costs (including the costs of obtaining regulatory approval to sell the generic) represent a further 15% of sales hence $0.85 \times \$1.15\text{m} = \0.98m remains.

Hence net revenues are about \$980,000 for each year in which they control the generic market. The anticipated flow of net revenues over time, accounting for the usual patterns of IG competition and gradual obsolescence of the drug market, is sufficiently lucrative for the firm to challenge a drug market. However, if an AG does enter, the executive I interviewed stated that he assumes that he will lose about 50% of the market so that net revenues fall to $0.5 \times \$980,000 = \$490,000$ annually which, the executive claims, is the point at which he would not bother challenging. If he was certain that there would be no AG entry, he would challenge drug markets with \$5+ million in annual sales.

Hence, taking the statements of the IG executive at face value, the effect of the threat of AG entry is to increase the minimum market size that justifies a challenge from the IG from \$5 to \$10 million. Assuming that generic prices would be about 50% of brand prices if an IG did enter, and assuming that no other generics enter markets with less than \$10m in annual sales, the threat of AG competition raises consumer costs by about 50% for every market not challenged. Assuming that the average size of the markets that go unchallenged on account of the threat of AG entry is \$7.5m, the threat of AG entry increases drug payer costs by \$3.75m annually (over the remaining life of the drug) for every market that goes unchallenged.

The IG executive stated that AG competition discourages them from challenging brand drugs with sales well above \$10m for which developing and producing a generic drug is particularly costly, for two reasons.¹⁶ First, as before, the threat of AG would take away IG market share and hence revenues. Second, AG competition in markets the IG has entered has reduced their retained earnings. This reduction in retained earnings has hampered their ability to finance development of specialized production capacity, and the cost of clinical studies. (According to the IG executive, many drugs are not amenable to bio-equivalence studies and require comparative clinical trials that can cost many millions or even tens of millions of dollars per study.) The CGPA shared with me a survey of eight participating generic firms conducted by IBM Global Business Services that, at face value, corroborates the claims of the IG executive. (The study was based on firms' responses that were not audited or otherwise validated by IBM.) The IBM study concludes: "Canadian generic pharmaceutical manufacturers continue to experience a financial loss on their sales in Canada. The net loss on Canadian sales was -2.7% in 2002 and the net loss for 2005 remained at -2.7%"

In order to validate these claims, one would need to analyse data on the minimum market size below which no generics will enter. According to the executive at the IG firm, the decision by an IG firm to challenge a brand drug is typically based on the sales of the brand drug in the 10th year that it has been on the market. To verify the claims by the IG executive, one would need to construct a time series of the year 10 sales of brand drugs and determine, for each of these drugs, whether an IG was observed to eventually enter.

Further deterrent effects of AGs on IG entry

Finally, the IG executive claimed that brand firms have attempted to use the threat of AG entry to negotiate agreements with their IG firm to delay entry until entry by another IG firm is imminent, at which time their IG firm will launch an AG. The proposed agreements involve

¹⁶ The IG executive cited as examples the following brand drugs (with annual sales) which will likely not be challenged: Epnex \$200 m, Remicade \$170 m, Enbrel \$160 m, Herceptin \$160 m, Flovent HFA \$130 m, Advair \$125 m, Duragesic \$115 m, Aranesp \$115 m, Rituxin \$110 m, Rebif \$85 m, Neupogen \$80 m, Prevmar \$75 m, Symbiocort \$60 m, Spiriva \$60 m, Advair MDI \$60 m, Copaxone \$60 m, Zoladex LA \$55 m, Betaseron \$50 m, Lupron Depot \$50 m. A brand firm executive countered that he would be very surprised if at least some of these drugs were not challenged by a generic.

sharing with the IG firm some of the consumers' savings that would have been realized by IG competition.¹⁷

5. How important are market opportunities in the U.S. at explaining the decisions of independent generic firms to enter a particular market?

IG firm representatives stated that market opportunities in the U.S. do not affect their decisions to enter domestic drug markets. The reason is that they incur fixed entry costs each time they challenge a brand drug in one of their three primary markets (Canada, US and the EU). These costs include the legal and related costs of challenging outstanding patents, and the costs of obtaining regulatory approval, the requirements of which typically vary by market. The different jurisdictions do not recognize court decisions made in other jurisdictions so that, for example, if an IG earns the right to sell a generic drug in the US that does not automatically allow them to sell in Canada. Moreover, regulations concerning the size, shape and color, and chemical properties of both the active ingredients and binding agents vary by jurisdiction so that the costs of obtaining regulatory approval must be incurred separately for each market.

Discussion

My analyses suggest that when AGs are among the first to enter a market, prices drop by about 12%. This seems plausible: the first generic is regulated to launch at a price no greater than 70% of the brand price and this should depress average prices paid for the drug. When AGs control between 1-40% of the generic market, the average price paid per mg of the brand drug increases slightly. It is unclear why this is the case. A brand firm contact did not believe that actual prices increase because both federal regulators (i.e. the PMPRB) and provincial drug plans limit drug price growth. One possibility is that the brand sales that do accrue after substantial entry by IGs are for rarely-used, non-genericized dosage forms and strengths that carry a higher per mg price than the forms/strengths that have been genericized. Irrespective of the impact of AG market share on brand prices, however, I find that AGs are mildly pro-competitive *in drug markets that face some generic competition*.

But IG firm executives state that the threat of AG entry has decreased their incentive to challenge 'marginal' drug markets. In particular the threat of AG entry has increased from \$5m to \$10m

¹⁷ One IG executive I interviewed stated: "Just as is now happening systematically in the US, brand companies in Canada are also using the threat to launch an authorized generic to extort deals with generic firms. i.e. they say: "if you proceed with an independent generic, we will launch an authorized generic and sell at low prices (subsidized by the continuing high priced sales under the brand label) and you will make nothing. So let's make a deal (at the expense of consumers) to avoid or delay competition and somehow share the benefits." The deals involve one or more features:

1. Generic agrees not to proceed with its own product, and to sell the authorized generic, but not until another independent generic is approved or about to be approved
2. Generic agrees not to launch its own product, but instead takes over manufacture of the product for the brand, and gets paid more for doing so than it would earn if it competed."

the threshold market size – the value of brand drug sales in the 10th year that it has been on the market, below which the IG firm will not attempt to enter.

IG executives also stated that AGs reduce IG earnings in markets which IGs do enter. The attendant loss of retained earnings hampers their ability to challenge brand drugs with sales well above \$10m, but which have particularly high entry costs. Finally, the IG executives claimed that brand firms have attempted to use the threat of AG entry to negotiate agreements with their IG firm to delay entry until entry by another IG firm is imminent, at which time their IG firm will launch an AG.

A comprehensive evaluation of the competitive effects of AGs would need to verify and quantify these costs and compare these to the benefits of AG competition.

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<http://www.fraserinstitute.ca/admin/books/files/GenericDrugopoly.pdf>

Appendix 2 Models of log average price in markets with generic entry

Models of log average price

Model 1.1

Model specification:

All drug markets used
 Indicators of one period lagged AG generic market share
 Indicators of total number of generic drugs introduced
 Drug market specific indicators
 Quarter of year indicator variables dropped
 Robust standard error estimator used

Linear regression

Number of obs = 6021
 F(97, 5922) = .
 Prob > F = .
 R-squared = 0.9913
 Root MSE = .24311

lap	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
laggshare20	-.0145032	.0134825	-1.08	0.282	-.0409338	.0119274
laggshare40	-.0586768	.0113652	-5.16	0.000	-.0809568	-.0363968
laggshare60	-.0604383	.0123816	-4.88	0.000	-.0847108	-.0361657
laggshare80	-.0479509	.014568	-3.29	0.001	-.0765094	-.0193924
laggshare100	-.1086092	.0119177	-9.11	0.000	-.1319722	-.0852462
ldtotgen1	-.1157372	.0135166	-8.56	0.000	-.1422345	-.0892398
ldtotgen2	-.1955292	.0128613	-15.20	0.000	-.220742	-.1703164
ldtotgen3	-.2491113	.0159344	-15.63	0.000	-.2803485	-.2178741
ldtotgen4	-.2650327	.0121951	-21.73	0.000	-.2889397	-.2411258
ldtotgen5	-.3045973	.0131185	-23.22	0.000	-.3303143	-.2788804
ldtotgen6	-.2723459	.0191917	-14.19	0.000	-.3099686	-.2347233
ldtotgen7	-.3274495	.0146875	-22.29	0.000	-.3562424	-.2986566
ldtotgen8	-.3444357	.0169227	-20.35	0.000	-.3776103	-.311261
ldtotgen9	-.4054365	.0179062	-22.64	0.000	-.4405392	-.3703339
ldtotgen10	-.5595747	.014723	-38.01	0.000	-.5884372	-.5307122
ldtotgen11	-.5645092	.0149968	-37.64	0.000	-.5939084	-.5351101
drug2	3.428896	.0088876	385.81	0.000	3.411473	3.446319
drug3	-2.8618	.0104877	-272.87	0.000	-2.882359	-2.84124
drug4	1.195959	.0904644	13.22	0.000	1.018616	1.373302
drug5	4.191443	.0106382	394.00	0.000	4.170588	4.212298
drug6	-.6420946	.0084044	-76.40	0.000	-.6585702	-.625619
drug7	4.755167	.0097976	485.34	0.000	4.73596	4.774373
drug8	2.575338	.0230683	111.64	0.000	2.530116	2.620561
drug9	-2.639401	.0288492	-91.49	0.000	-2.695956	-2.582846
drug10	-.475864	.0107014	-44.47	0.000	-.4968427	-.4548853
drug11	-4.09638	.0116516	-351.57	0.000	-4.119222	-4.073539
drug12	-3.324511	.0101459	-327.67	0.000	-3.3444	-3.304621
drug13	-4.622968	.021668	-213.35	0.000	-4.665445	-4.580491
drug14	-3.289993	.0104862	-313.74	0.000	-3.31055	-3.269437
drug15	-5.053125	.0084384	-598.82	0.000	-5.069667	-5.036582
drug16	-1.00875	.0104285	-96.73	0.000	-1.029194	-.9883065
drug17	-3.977562	.0121738	-326.73	0.000	-4.001427	-3.953697
drug18	-5.18226	.0090506	-572.59	0.000	-5.200002	-5.164517
drug19	-3.392844	.0106829	-317.60	0.000	-3.413787	-3.371902
drug20	-2.768377	.045196	-61.25	0.000	-2.856977	-2.679776
drug21	-4.541323	.0122875	-369.59	0.000	-4.56541	-4.517235
drug22	-1.417252	.0116229	-121.94	0.000	-1.440037	-1.394467
drug23	-1.513434	.010407	-145.42	0.000	-1.533835	-1.493032
drug24	.0904029	.0192183	4.70	0.000	.052728	.1280777
drug25	-1.257087	.0219797	-57.19	0.000	-1.300175	-1.213999
drug26	-1.015056	.0311714	-32.56	0.000	-1.076164	-.9539489
drug27	-1.565534	.0989576	-15.82	0.000	-1.759527	-1.371541
drug28	-1.946037	.0150807	-129.04	0.000	-1.975601	-1.916473
drug29	-4.584397	.0140168	-327.06	0.000	-4.611875	-4.556918
drug30	.5060018	.0094763	53.40	0.000	.4874248	.5245789
drug31	-3.169093	.0096308	-329.06	0.000	-3.187973	-3.150213
drug32	-3.514334	.0207674	-169.22	0.000	-3.555045	-3.473622
drug33	-2.973235	.0105299	-282.36	0.000	-2.993878	-2.952593
drug34	-4.164655	.008904	-467.73	0.000	-4.18211	-4.1472
drug35	-4.587265	.0123362	-371.86	0.000	-4.611449	-4.563082
drug36	-.790091	.0140769	-56.13	0.000	-.8176868	-.7624951
drug37	-.3180133	.0092303	-34.45	0.000	-.336108	-.2999185
drug38	1.876656	.3634283	5.16	0.000	1.164204	2.589108
drug39	-1.949321	.0287602	-67.78	0.000	-2.005702	-1.892941
drug40	-.0539281	.0161459	-3.34	0.001	-.0855798	-.0222763
drug41	-.9879428	.0095992	-102.92	0.000	-1.006761	-.9691248
drug42	-3.983419	.0098794	-403.20	0.000	-4.002786	-3.964051

drug43	-3.374512	.0116816	-288.87	0.000	-3.397412	-3.351612
drug44	-4.066363	.0085229	-477.11	0.000	-4.083071	-4.049655
drug45	-4.063714	.0133109	-305.29	0.000	-4.089808	-4.037619
drug46	-.645858	.0129643	-49.82	0.000	-.6712727	-.6204432
drug47	.2043898	.0173437	11.78	0.000	.1703898	.2383899
drug48	-4.27634	.0108578	-393.85	0.000	-4.297625	-4.255054
drug49	1.067576	.1796458	5.94	0.000	.7154051	1.419748
drug50	-2.562369	.0118583	-216.08	0.000	-2.585616	-2.539123
drug51	-1.551582	.0121523	-127.68	0.000	-1.575404	-1.527759
drug52	1.086123	.0083284	130.41	0.000	1.069796	1.102449
drug53	-.4997754	.0099135	-50.41	0.000	-.5192095	-.4803414
drug54	-.5312374	.0124582	-42.64	0.000	-.555566	-.5068148
drug55	-2.922354	.0118087	-247.47	0.000	-2.945503	-2.899204
drug56	1.37354	.0214483	64.04	0.000	1.331493	1.415586
drug57	-1.262043	.0103086	-122.43	0.000	-1.282251	-1.241834
drug58	2.67766	.0099918	267.99	0.000	2.658072	2.697247
drug59	3.719948	.0105767	351.71	0.000	3.699214	3.740682
drug60	-4.641267	.0132655	-349.88	0.000	-4.667272	-4.615262
drug61	-3.315048	.0095249	-348.04	0.000	-3.333721	-3.296376
drug62	-3.339985	.0118625	-281.56	0.000	-3.36324	-3.316731
drug63	-.4396876	.0081908	-53.68	0.000	-.4557447	-.4236306
drug64	-4.836603	.0126927	-381.05	0.000	-4.861486	-4.811721
drug65	2.316317	.0862683	26.85	0.000	2.1472	2.485435
drug66	-.7146585	.0137181	-52.10	0.000	-.741551	-.687766
drug67	3.314119	.0727712	45.54	0.000	3.171461	3.456777
drug68	-.7801151	.0111608	-69.90	0.000	-.8019942	-.7582359
drug69	-3.564098	.0143805	-247.84	0.000	-3.592289	-3.535907
drug70	-.4325102	.0687193	-6.29	0.000	-.5672252	-.2977953
drug71	-1.866399	.0097092	-192.23	0.000	-1.885433	-1.847366
drug72	-.5040115	.0163011	-30.92	0.000	-.5359676	-.4720555
drug73	6.605436	.0276082	239.26	0.000	6.551314	6.659558
drug74	-2.419718	.0124577	-194.23	0.000	-2.444414	-2.395297
drug75	-2.084197	.009074	-229.69	0.000	-2.101985	-2.066408
drug76	-3.694298	.0146621	-251.96	0.000	-3.723041	-3.665555
drug77	.1037097	.0152011	6.82	0.000	.07391	.1335093
drug78	3.304044	.018963	174.24	0.000	3.26687	3.341219
drug79	-3.893479	.0096407	-403.86	0.000	-3.912379	-3.87458
drug80	-1.210858	.007939	-152.52	0.000	-1.226421	-1.195295
drug81	-2.370689	.1018381	-23.28	0.000	-2.570329	-2.17105
drug82	-.2474393	.0126145	-19.62	0.000	-.2721684	-.2227103
drug83	2.228096	.1489024	14.96	0.000	1.936193	2.519999
_cons	-1.604222	.0076982	-208.39	0.000	-1.619313	-1.58913

Variable definitions

variable name	description
lap	log average brand price
dag	=1 if AG on market
ldag	=1 if dag[t-1]=1
aggshare20	=1 if 0% < aggshare <= 20%
aggshare40	=1 if 20% < aggshare <= 40%
aggshare60	=1 if 40% < aggshare <= 60%
aggshare80	=1 if 60% < aggshare <= 80%
aggshare100	=1 if 80% < aggshare <= 100%
laggshare20	=1 if 0% < aggshare[t-1] <= 20%
laggshare40	=1 if 20% < aggshare[t-1] <= 40%
laggshare60	=1 if 40% < aggshare[t-1] <= 60%
laggshare80	=1 if 60% < aggshare[t-1] <= 80%
laggshare100	=1 if 80% < aggshare[t-1] <= 100%
ldtotgen1	=1 if number of IGS[t-1] = 1
ldtotgen2	=1 if number of IGS[t-1] = 2
ldtotgen3	=1 if number of IGS[t-1] = 3
ldtotgen4	=1 if number of IGS[t-1] = 4
ldtotgen5	=1 if number of IGS[t-1] = 5
ldtotgen6	=1 if number of IGS[t-1] = 6
ldtotgen7	=1 if number of IGS[t-1] = 7
ldtotgen8	=1 if number of IGS[t-1] = 8
ldtotgen9	=1 if number of IGS[t-1] = 9
ldtotgen10	=1 if number of IGS[t-1] = 10
ldtotgen11	=1 if number of IGS[t-1] = 11
drug2	drugid==AMCINONIDE
drug3	drugid==AMIODARONE
drug4	drugid==AMIODARONE INJ
drug5	drugid==BETAXOLOL
drug6	drugid==BISOPROLOL
drug7	drugid==BRIMONIDINE
drug8	drugid==BUTORPHANOL
drug9	drugid==CALCITONIN (SALMON)

drug10	drugid==CARVEDILOL
drug11	drugid==CEFADROXIL
drug12	drugid==CEFUROXIME AXETIL
drug13	drugid==CEFUROXIME AXETIL LIQUID
drug14	drugid==CIPROFLOXACIN
drug15	drugid==CIPROFLOXACIN LIQUID
drug16	drugid==CITALOPRAM
drug17	drugid==CLAVULANIC ACID
drug18	drugid==CLAVULANIC ACID LIQUID
drug19	drugid==CLINDAMYCIN
drug20	drugid==CLINDAMYCIN INJ
drug21	drugid==CLINDAMYCIN LIQUID
drug22	drugid==CLOBAZAM
drug23	drugid==CLOZAPINE
drug24	drugid==COLISTIN
drug25	drugid==CYCLOSPORINE
drug26	drugid==CYCLOSPORINE INJ
drug27	drugid==CYCLOSPORINE LIQUID
drug28	drugid==DEFEROXAMINE
drug29	drugid==DIVALPROEX
drug30	drugid==DOXAZOSIN
drug31	drugid==ETIDRONIC ACID
drug32	drugid==FENOFIBRATE
drug33	drugid==FENOFIBRATE MICRO
drug34	drugid==FLAVOXATE
drug35	drugid==FLOCTAFENINE
drug36	drugid==FLUCONAZOLE
drug37	drugid==FLUCONAZOLE 150MG
drug38	drugid==FLUCONAZOLE INJ
drug39	drugid==FLUCONAZOLE LIQUID
drug40	drugid==FLUNARIZINE
drug41	drugid==FOSINOPRIL
drug42	drugid==GABAPENTIN
drug43	drugid==GLICLAZIDE
drug44	drugid==HYDROXYCHLOROQUINE
drug45	drugid==HYDROXYUREA
drug46	drugid==KETOROLAC
drug47	drugid==KETOROLAC INJ
drug48	drugid==LABETALOL
drug49	drugid==LABETALOL INJ
drug50	drugid==LAMOTRIGINE
drug51	drugid==LAMOTRIGINE CHEWABLE
drug52	drugid==LEFLUNOMIDE
drug53	drugid==LORATADINE
drug54	drugid==MELOXICAM
drug55	drugid==METHAZOLAMIDE
drug56	drugid==MIDAZOLAM
drug57	drugid==MIRTAZAPINE
drug58	drugid==MISOPROSTOL
drug59	drugid==MOMETASONE
drug60	drugid==NABUMETONE
drug61	drugid==NEFAZODONE
drug62	drugid==NORFLOXACIN
drug63	drugid==OMEPRAZOLE
drug64	drugid==OXAPROZIN
drug65	drugid==PAMIDRONIC ACID
drug66	drugid==PAROXETINE
drug67	drugid==PIPERACILLIN
drug68	drugid==PRAVASTATIN
drug69	drugid==PROPRAFENONE
drug70	drugid==PROPOFOL
drug71	drugid==SERTRALINE
drug72	drugid==SIMVASTATIN
drug73	drugid==SUFENTANIL
drug74	drugid==TERBINAFINE
drug75	drugid==TERCONAZOLE
drug76	drugid==TICLOPIDINE
drug77	drugid==TIZANIDINE
drug78	drugid==TRIFLURIDINE
drug79	drugid==TRIMEBUTINE
drug80	drugid==VANCOMYCIN
drug81	drugid==VANCOMYCIN INJ
drug82	drugid==WARFARIN
drug83	drugid==WARFARIN INJ

Model 1.2

Model specification:

All drug markets used
 Indicators of contemporaneous AG generic market share
 Indicators of total number of generic drugs introduced
 Drug market specific indicators
 Quarter of year indicator variables dropped
 Robust standard error estimator used

Linear regression

Number of obs = 6021
 F(97, 5922) = .
 Prob > F = .
 R-squared = 0.9913
 Root MSE = .24313

lap	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
aggshare20	-.0105929	.0136842	-0.77	0.439	-.0374189	.0162331
aggshare40	-.0522137	.0115961	-4.50	0.000	-.0749463	-.0294812
aggshare60	-.0542677	.0126691	-4.28	0.000	-.0791037	-.0294317
aggshare80	-.0358775	.0143117	-2.51	0.012	-.0639335	-.0078214
aggshare100	-.1090576	.0108704	-10.03	0.000	-.1303675	-.0877477
ldtotgen1	-.1177324	.0136421	-8.63	0.000	-.144476	-.0909888
ldtotgen2	-.1989836	.0129264	-15.39	0.000	-.224324	-.1736432
ldtotgen3	-.2536046	.0159592	-15.89	0.000	-.2848905	-.2223188
ldtotgen4	-.2694731	.0122699	-21.96	0.000	-.2935266	-.2454196
ldtotgen5	-.3099103	.0131406	-23.58	0.000	-.3356707	-.28415
ldtotgen6	-.2779776	.0192726	-14.42	0.000	-.315759	-.2401963
ldtotgen7	-.3318518	.0146718	-22.62	0.000	-.3606138	-.3030898
ldtotgen8	-.3496621	.0171132	-20.43	0.000	-.3832102	-.316114
ldtotgen9	-.4077835	.0177947	-22.92	0.000	-.4426676	-.3728994
ldtotgen10	-.5605023	.0146102	-38.36	0.000	-.5891437	-.5318609
ldtotgen11	-.5654369	.014886	-37.98	0.000	-.5946189	-.5362548
drug2	3.429279	.0089652	382.51	0.000	3.411704	3.446854
drug3	-2.86251	.0104349	-274.32	0.000	-2.882966	-2.842053
drug4	1.197134	.0905085	13.23	0.000	1.019704	1.374563
drug5	4.192197	.0106819	392.46	0.000	4.171256	4.213137
drug6	-.6420058	.0083677	-76.72	0.000	-.6584095	-.625602
drug7	4.756508	.0097239	489.16	0.000	4.737445	4.77557
drug8	2.576453	.0230295	111.88	0.000	2.531307	2.619599
drug9	-2.636428	.0288884	-91.28	0.000	-2.693051	-2.579805
drug10	-.4756078	.0106807	-44.53	0.000	-.4965459	-.4546697
drug11	-4.09965	.011384	-360.12	0.000	-4.121967	-4.077334
drug12	-3.326335	.010132	-328.30	0.000	-3.346198	-3.306473
drug13	-4.623513	.0216556	-213.50	0.000	-4.665966	-4.58106
drug14	-3.29026	.0105161	-312.88	0.000	-3.310875	-3.269645
drug15	-5.053669	.0084066	-601.15	0.000	-5.070149	-5.037189
drug16	-1.008959	.0104552	-96.50	0.000	-1.029455	-.988463
drug17	-3.980263	.0121731	-326.97	0.000	-4.004126	-3.956399
drug18	-5.183275	.009052	-572.61	0.000	-5.201021	-5.16553
drug19	-3.394211	.0109229	-310.74	0.000	-3.415624	-3.372799
drug20	-2.766091	.0452021	-61.19	0.000	-2.854703	-2.677478
drug21	-4.541867	.0122656	-370.29	0.000	-4.565912	-4.517822
drug22	-1.418962	.0114887	-123.51	0.000	-1.441484	-1.39644
drug23	-1.513451	.010434	-145.05	0.000	-1.533905	-1.492997
drug24	.0908014	.0192193	4.72	0.000	.0531245	.1284783
drug25	-1.255388	.0218897	-57.35	0.000	-1.2983	-1.212476
drug26	-1.015601	.0311628	-32.59	0.000	-1.076691	-.9545104
drug27	-1.564483	.0989786	-15.81	0.000	-1.758517	-1.370449
drug28	-1.945167	.0151425	-128.46	0.000	-1.974852	-1.915482
drug29	-4.586229	.0141653	-323.76	0.000	-4.613998	-4.55846
drug30	.5071197	.0094278	53.79	0.000	.4886378	.5256017
drug31	-3.169349	.0096148	-329.63	0.000	-3.188198	-3.150501
drug32	-3.512637	.0208007	-168.87	0.000	-3.553414	-3.47186
drug33	-2.974646	.0105846	-281.04	0.000	-2.995395	-2.953896
drug34	-4.16377	.0088913	-468.30	0.000	-4.1812	-4.14634
drug35	-4.587113	.0122424	-374.69	0.000	-4.611112	-4.563113
drug36	-.7892319	.0140721	-56.08	0.000	-.8168183	-.7616454
drug37	-.3177196	.009234	-34.41	0.000	-.3358216	-.2996177
drug38	1.876311	.3634578	5.16	0.000	1.163801	2.588821
drug39	-1.949866	.0287508	-67.82	0.000	-2.006228	-1.893504
drug40	-.0537035	.0160927	-3.34	0.001	-.0852509	-.022156
drug41	-.9884011	.0096051	-102.90	0.000	-1.007231	-.9695716
drug42	-3.983983	.0099427	-400.69	0.000	-4.003474	-3.964491
drug43	-3.379436	.0115724	-292.03	0.000	-3.402122	-3.356749
drug44	-4.06628	.008486	-479.17	0.000	-4.082915	-4.049644
drug45	-4.063055	.0132263	-307.19	0.000	-4.088984	-4.037127
drug46	-.6430602	.0130039	-49.45	0.000	-.6685525	-.6175679
drug47	.2057248	.017307	11.89	0.000	.1717968	.2396529

drug48	-4.275899	.010812	-395.48	0.000	-4.297094	-4.254703
drug49	1.068229	.1796112	5.95	0.000	.7161254	1.420332
drug50	-2.562973	.0118708	-215.91	0.000	-2.586244	-2.539702
drug51	-1.552126	.0121302	-127.96	0.000	-1.575906	-1.528347
drug52	1.085651	.0083073	130.69	0.000	1.069365	1.101936
drug53	-.4994066	.0099429	-50.23	0.000	-.5188983	-.4799149
drug54	-.5318038	.012967	-41.01	0.000	-.5572239	-.5063837
drug55	-2.922249	.0117665	-248.35	0.000	-2.945316	-2.899182
drug56	1.37662	.0214047	64.31	0.000	1.334659	1.418581
drug57	-1.261782	.0103467	-121.95	0.000	-1.282066	-1.241499
drug58	2.676545	.0100342	266.74	0.000	2.656875	2.696216
drug59	3.719556	.0105187	353.61	0.000	3.698935	3.740176
drug60	-4.638484	.0133447	-347.59	0.000	-4.664645	-4.612324
drug61	-3.317023	.0096558	-343.53	0.000	-3.335951	-3.298094
drug62	-3.336692	.0118492	-281.60	0.000	-3.359921	-3.313464
drug63	-.4399919	.0081819	-53.78	0.000	-.4560314	-.4239524
drug64	-4.835942	.012752	-379.23	0.000	-4.860941	-4.810943
drug65	2.316373	.0864238	26.80	0.000	2.146951	2.485795
drug66	-.7148425	.0137109	-52.14	0.000	-.7417208	-.6879642
drug67	3.314073	.0727775	45.54	0.000	3.171403	3.456744
drug68	-.7814533	.0114489	-68.26	0.000	-.8038973	-.7590094
drug69	-3.566118	.0143731	-248.11	0.000	-3.594294	-3.537941
drug70	-.430422	.0687178	-6.26	0.000	-.565134	-.29571
drug71	-1.868536	.0096466	-193.70	0.000	-1.887446	-1.849625
drug72	-.5036286	.0161735	-31.14	0.000	-.5353345	-.4719226
drug73	6.605944	.0276234	239.14	0.000	6.551792	6.660096
drug74	-2.421016	.0123109	-196.66	0.000	-2.44515	-2.396882
drug75	-2.084717	.009048	-230.41	0.000	-2.102455	-2.06698
drug76	-3.690633	.0145974	-252.83	0.000	-3.719249	-3.662017
drug77	.103165	.0151834	6.79	0.000	.0734	.1329301
drug78	3.303716	.0189645	174.21	0.000	3.266539	3.340893
drug79	-3.893447	.009637	-404.01	0.000	-3.912339	-3.874555
drug80	-1.211402	.0079052	-153.24	0.000	-1.226899	-1.195905
drug81	-2.367788	.1018102	-23.26	0.000	-2.567373	-2.168203
drug82	-.2457044	.0126145	-19.48	0.000	-.2704334	-.2209753
drug83	2.227551	.1489006	14.96	0.000	1.935652	2.519451
_cons	-1.603677	.0076633	-209.27	0.000	-1.6187	-1.588654

Model 1.3

Model specification:

Drug markets with apparent measurement error removed
 Indicators of one period lagged AG generic market share
 Indicators of total number of generic drugs introduced
 Drug market specific indicators
 Quarter of year indicator variables dropped
 Robust standard error estimator used

Linear regression

Number of obs = 4931
 F(78, 4851) = .
 Prob > F = .
 R-squared = 0.9984
 Root MSE = .10427

lap	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
laggshare20	-.0250899	.012511	-2.01	0.045	-.049617	-.0005628
laggshare40	-.0687131	.0084515	-8.13	0.000	-.0852817	-.0521444
laggshare60	-.066947	.0082947	-8.07	0.000	-.0832084	-.0506856
laggshare80	-.0535387	.0109299	-4.90	0.000	-.0749661	-.0321112
laggshare100	-.1085286	.0104509	-10.38	0.000	-.129017	-.0880401
ldtotgen1	-.1154129	.0062483	-18.47	0.000	-.1276624	-.1031634
ldtotgen2	-.1998336	.007496	-26.66	0.000	-.2145291	-.1851381
ldtotgen3	-.219235	.0077548	-28.27	0.000	-.2344379	-.2040321
ldtotgen4	-.2563404	.0091505	-28.01	0.000	-.2742795	-.2384014
ldtotgen5	-.2951241	.0105049	-28.09	0.000	-.3157185	-.2745298
ldtotgen6	-.2614242	.0175769	-14.87	0.000	-.2958829	-.2269654
ldtotgen7	-.3179284	.0129441	-24.56	0.000	-.3433048	-.292552
ldtotgen8	-.3353393	.0160302	-20.92	0.000	-.3667657	-.3039129
ldtotgen9	-.3976185	.0175061	-22.71	0.000	-.4319384	-.3632986
ldtotgen10	-.5572985	.0148967	-37.41	0.000	-.5865029	-.5280942
ldtotgen11	-.5622331	.0151673	-37.07	0.000	-.5919678	-.5324983
drug2	3.429628	.0088644	386.90	0.000	3.412249	3.447006
drug3	-2.863683	.0104299	-274.56	0.000	-2.88413	-2.843235
drug4	(dropped)					
drug5	4.191028	.0091422	458.43	0.000	4.173105	4.208951
drug6	-.6422252	.0083619	-76.80	0.000	-.6586183	-.6258321
drug7	4.75491	.0097303	488.67	0.000	4.735834	4.773986
drug8	2.576388	.0228519	112.74	0.000	2.531588	2.621188
drug9	-2.643734	.0271156	-97.50	0.000	-2.696893	-2.590575
drug10	-.4785822	.0106185	-45.07	0.000	-.4993993	-.4577651
drug11	-4.092119	.0112189	-364.75	0.000	-4.114113	-4.070125
drug12	-3.322148	.0097714	-339.99	0.000	-3.341304	-3.302991
drug13	(dropped)					
drug14	-3.290371	.0101746	-323.39	0.000	-3.310318	-3.270425
drug15	(dropped)					
drug16	-1.008902	.0101901	-99.01	0.000	-1.028879	-.9889243
drug17	-3.97426	.0118716	-334.77	0.000	-3.997534	-3.950986
drug18	(dropped)					
drug19	-3.397835	.0104677	-324.60	0.000	-3.418357	-3.377314
drug20	(dropped)					
drug21	(dropped)					
drug22	-1.419217	.0107626	-131.87	0.000	-1.440316	-1.398117
drug23	-1.513489	.0104364	-145.02	0.000	-1.533949	-1.493029
drug24	.090045	.0189407	4.75	0.000	.0529125	.1271774
drug25	-1.257338	.0212384	-59.20	0.000	-1.298975	-1.215701
drug26	(dropped)					
drug27	(dropped)					
drug28	-1.946472	.0137951	-141.10	0.000	-1.973516	-1.919427
drug29	-4.581994	.013702	-334.40	0.000	-4.608856	-4.555132
drug30	.5060398	.0093887	53.90	0.000	.4876337	.524446
drug31	-3.169344	.0095927	-330.39	0.000	-3.18815	-3.150538
drug32	(dropped)					
drug33	-2.974267	.0105455	-282.04	0.000	-2.994941	-2.953593
drug34	-4.172583	.0083274	-501.07	0.000	-4.188908	-4.156257
drug35	-4.587583	.0121986	-376.07	0.000	-4.611498	-4.563668
drug36	-.7965055	.0131938	-60.37	0.000	-.8223713	-.7706397
drug37	-.319436	.0090024	-35.48	0.000	-.3370848	-.3017873
drug38	(dropped)					
drug39	(dropped)					
drug40	-.0542577	.0159906	-3.39	0.001	-.0856065	-.0229088
drug41	-.9873014	.0093753	-105.31	0.000	-1.005681	-.9689216
drug42	-3.983799	.009486	-419.96	0.000	-4.002396	-3.965202
drug43	-3.37712	.0110202	-306.45	0.000	-3.398725	-3.355516
drug44	-4.066488	.0084677	-480.23	0.000	-4.083088	-4.049887
drug45	-4.063469	.0129194	-314.52	0.000	-4.088797	-4.038141
drug46	-.6465993	.0103117	-62.71	0.000	-.666815	-.6263837
drug47	(dropped)					

drug48	-4.276704	.010256	-417.00	0.000	-4.296811	-4.256598
drug49	(dropped)					
drug50	-2.562644	.0118294	-216.63	0.000	-2.585835	-2.539453
drug51	(dropped)					
drug52	1.085906	.008081	134.38	0.000	1.070064	1.101749
drug53	-.5001285	.0093928	-53.25	0.000	-.5185426	-.4817144
drug54	-.5297909	.01234	-42.93	0.000	-.5539828	-.5055989
drug55	-2.922664	.0117077	-249.64	0.000	-2.945616	-2.899711
drug56	1.362701	.0206438	66.01	0.000	1.322229	1.403172
drug57	-1.261771	.0103118	-122.36	0.000	-1.281987	-1.241555
drug58	2.682531	.0091293	293.84	0.000	2.664633	2.700428
drug59	3.72053	.0104531	355.93	0.000	3.700037	3.741023
drug60	-4.656806	.0104594	-445.23	0.000	-4.677311	-4.636301
drug61	-3.314236	.0093734	-353.58	0.000	-3.332612	-3.29586
drug62	-3.345091	.0106155	-315.12	0.000	-3.365902	-3.32428
drug63	-.4399313	.0081176	-54.19	0.000	-.4558455	-.4240171
drug64	-4.835949	.0125915	-384.07	0.000	-4.860634	-4.811264
drug65	2.318381	.0863028	26.86	0.000	2.149188	2.487573
drug66	-.7155094	.0133825	-53.47	0.000	-.7417452	-.6892737
drug67	(dropped)					
drug68	-.7805302	.0108418	-71.99	0.000	-.8017849	-.7592754
drug69	-3.55916	.0140885	-252.63	0.000	-3.58678	-3.53154
drug70	(dropped)					
drug71	-1.863737	.0095944	-194.25	0.000	-1.882547	-1.844928
drug72	-.5064923	.0165345	-30.63	0.000	-.5389075	-.4740771
drug73	6.605061	.0273482	241.52	0.000	6.551446	6.658676
drug74	-2.42787	.0111934	-216.90	0.000	-2.449814	-2.405925
drug75	-2.084405	.0087793	-237.42	0.000	-2.101617	-2.067194
drug76	-3.703824	.0139771	-264.99	0.000	-3.731225	-3.676422
drug77	(dropped)					
drug78	3.303804	.01892	174.62	0.000	3.266713	3.340896
drug79	-3.893778	.0095614	-407.24	0.000	-3.912522	-3.875033
drug80	-1.211062	.0075566	-160.27	0.000	-1.225877	-1.196248
drug81	(dropped)					
drug82	-.2542743	.0120617	-21.08	0.000	-.2779208	-.2306278
drug83	(dropped)					
_cons	-1.604017	.0073033	-219.63	0.000	-1.618335	-1.589699

Model 1.4

Model specification:

Drug markets with apparent measurement error removed
 Indicators of contemporaneous AG generic market share
 Indicators of total number of generic drugs introduced
 Drug market specific indicators
 Quarter of year indicator variables dropped
 Robust standard error estimator used

Linear regression

Number of obs = 4931
 F(78, 4851) = .
 Prob > F = .
 R-squared = 0.9984
 Root MSE = .10437

lap	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
aggshare20	-.0210724	.0127095	-1.66	0.097	-.0459887	.003844
aggshare40	-.0612468	.0086204	-7.10	0.000	-.0781468	-.0443469
aggshare60	-.0604142	.0084447	-7.15	0.000	-.0769696	-.0438588
aggshare80	-.0409022	.0104166	-3.93	0.000	-.0613234	-.020481
aggshare100	-.1086218	.0096326	-11.28	0.000	-.1275061	-.0897375
ldtotgen1	-.1174343	.0062876	-18.68	0.000	-.1297609	-.1051078
ldtotgen2	-.2039383	.0075801	-26.90	0.000	-.2187988	-.1890779
ldtotgen3	-.2242902	.007813	-28.71	0.000	-.2396071	-.2089732
ldtotgen4	-.2611748	.0092339	-28.28	0.000	-.2792775	-.2430721
ldtotgen5	-.3009351	.0105722	-28.46	0.000	-.3216613	-.2802088
ldtotgen6	-.2674645	.0177035	-15.11	0.000	-.3021714	-.2327576
ldtotgen7	-.3228255	.0129235	-24.98	0.000	-.3481614	-.2974896
ldtotgen8	-.3407293	.0162714	-20.94	0.000	-.3726285	-.30883
ldtotgen9	-.3999904	.0173976	-22.99	0.000	-.4340976	-.3658832
ldtotgen10	-.5583134	.0147698	-37.80	0.000	-.5872689	-.5293579
ldtotgen11	-.5632479	.0150426	-37.44	0.000	-.5927383	-.5337576
drug2	3.429904	.0089333	383.94	0.000	3.412391	3.447417
drug3	-2.864482	.0103778	-276.02	0.000	-2.884828	-2.844137
drug4	(dropped)					
drug5	4.191755	.0091624	457.50	0.000	4.173792	4.209717
drug6	-.6421497	.008326	-77.13	0.000	-.6584724	-.6258269
drug7	4.756092	.0096714	491.77	0.000	4.737132	4.775052
drug8	2.57767	.0228069	113.02	0.000	2.532958	2.622382
drug9	-2.640238	.027155	-97.23	0.000	-2.693474	-2.587002
drug10	-.4782689	.0105897	-45.16	0.000	-.4990296	-.4575081
drug11	-4.095683	.0109711	-373.31	0.000	-4.117191	-4.074175
drug12	-3.324103	.0097517	-340.87	0.000	-3.343221	-3.304985
drug13	(dropped)					
drug14	-3.29052	.0101979	-322.67	0.000	-3.310513	-3.270527
drug15	(dropped)					
drug16	-1.008953	.010194	-98.98	0.000	-1.028937	-.9889679
drug17	-3.97703	.0118505	-335.60	0.000	-4.000262	-3.953797
drug18	(dropped)					
drug19	-3.399145	.0106675	-318.64	0.000	-3.420058	-3.378231
drug20	(dropped)					
drug21	(dropped)					
drug22	-1.421188	.0106625	-133.29	0.000	-1.442091	-1.400285
drug23	-1.513514	.0104698	-144.56	0.000	-1.53404	-1.492989
drug24	.0904123	.0189364	4.77	0.000	.0532884	.1275362
drug25	-1.255897	.0212387	-59.13	0.000	-1.297535	-1.21426
drug26	(dropped)					
drug27	(dropped)					
drug28	-1.945627	.013837	-140.61	0.000	-1.972753	-1.9185
drug29	-4.583867	.013799	-332.19	0.000	-4.610919	-4.556815
drug30	.5075391	.0093322	54.39	0.000	.4892438	.5258344
drug31	-3.16964	.0095762	-330.99	0.000	-3.188414	-3.150867
drug32	(dropped)					
drug33	-2.975684	.0105736	-281.43	0.000	-2.996413	-2.954956
drug34	-4.17156	.0082909	-503.15	0.000	-4.187814	-4.155307
drug35	-4.587465	.0121004	-379.12	0.000	-4.611187	-4.563743
drug36	-.7953889	.0132043	-60.24	0.000	-.8212753	-.7695025
drug37	-.3188726	.009023	-35.34	0.000	-.3365617	-.3011835
drug38	(dropped)					
drug39	(dropped)					
drug40	-.0540666	.0159335	-3.39	0.001	-.0853034	-.0228298
drug41	-.9876824	.0093619	-105.50	0.000	-1.006036	-.9693287
drug42	-3.984374	.009552	-417.12	0.000	-4.0031	-3.965648
drug43	-3.382046	.0107469	-314.70	0.000	-3.403115	-3.360978
drug44	-4.066417	.0084293	-482.41	0.000	-4.082942	-4.049891
drug45	-4.062758	.0128179	-316.96	0.000	-4.087887	-4.037629
drug46	-.6432536	.0103788	-61.98	0.000	-.6636007	-.6229064
drug47	(dropped)					

drug48	-4.276294	.010195	-419.45	0.000	-4.296281	-4.256307
drug49	(dropped)					
drug50	-2.563089	.0118475	-216.34	0.000	-2.586315	-2.539862
drug51	(dropped)					
drug52	1.085392	.0080543	134.76	0.000	1.069602	1.101182
drug53	-.4997912	.0094145	-53.09	0.000	-.5182479	-.4813346
drug54	-.5302009	.0128379	-41.30	0.000	-.555369	-.5050327
drug55	-2.922594	.0116631	-250.58	0.000	-2.945459	-2.899729
drug56	1.366066	.0205686	66.42	0.000	1.325742	1.40639
drug57	-1.261438	.010363	-121.73	0.000	-1.281754	-1.241122
drug58	2.681419	.0091142	294.20	0.000	2.663551	2.699287
drug59	3.720116	.0103533	359.32	0.000	3.699819	3.740413
drug60	-4.65371	.0105557	-440.87	0.000	-4.674404	-4.633016
drug61	-3.316207	.0094934	-349.32	0.000	-3.334818	-3.297595
drug62	-3.34142	.0106104	-314.92	0.000	-3.362221	-3.320619
drug63	-.440276	.0081077	-54.30	0.000	-.4561708	-.4243812
drug64	-4.835184	.012664	-381.80	0.000	-4.860011	-4.810357
drug65	2.31856	.086477	26.81	0.000	2.149026	2.488094
drug66	-.7156838	.0133707	-53.53	0.000	-.7418964	-.6894712
drug67	(dropped)					
drug68	-.7819502	.0111049	-70.42	0.000	-.8037207	-.7601796
drug69	-3.561285	.0140689	-253.13	0.000	-3.588866	-3.533703
drug70	(dropped)					
drug71	-1.866035	.0095125	-196.17	0.000	-1.884684	-1.847386
drug72	-.5060657	.0163938	-30.87	0.000	-.5382051	-.4739263
drug73	6.605538	.0273584	241.44	0.000	6.551903	6.659173
drug74	-2.429198	.0110348	-220.14	0.000	-2.450831	-2.407565
drug75	-2.084969	.0087464	-238.38	0.000	-2.102116	-2.067822
drug76	-3.699753	.0139224	-265.74	0.000	-3.727047	-3.672458
drug77	(dropped)					
drug78	3.303435	.0189211	174.59	0.000	3.266341	3.340529
drug79	-3.893781	.0095568	-407.44	0.000	-3.912517	-3.875046
drug80	-1.211651	.0075129	-161.28	0.000	-1.226379	-1.196922
drug81	(dropped)					
drug82	-.2522375	.0120597	-20.92	0.000	-.27588	-.2285949
drug83	(dropped)					
_cons	-1.603429	.0072581	-220.92	0.000	-1.617658	-1.5892

Models of log average brand drug price

Model 2.1

Model specification:

All drug markets used

Indicators of one period lagged AG generic market share

Indicators of total number of generic drugs introduced

Drug market specific indicators

Quarter of year indicator variables dropped

Robust standard error estimator used

Linear regression

Number of obs = 5851
 F(97, 5752) = .
 Prob > F = .
 R-squared = 0.9908
 Root MSE = .25123

lbap	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
laggshare20	.0559338	.0183238	3.05	0.002	.0200122	.0918553
laggshare40	.0030756	.0128514	0.24	0.811	-.0221179	.0282691
laggshare60	-.0297272	.0122212	-2.43	0.015	-.0536674	-.005787
laggshare80	-.0250321	.0129111	-1.94	0.053	-.0503427	.0002785
laggshare100	.010653	.0084845	1.26	0.209	-.0059799	.0272858
ldtotgen1	-.0093424	.0130851	-0.71	0.475	-.0349941	.0163092
ldtotgen2	-.0049055	.0149745	-0.33	0.743	-.0342612	.0244502
ldtotgen3	.0081458	.0190863	0.43	0.670	-.0292705	.0455621
ldtotgen4	.0122816	.0138309	0.89	0.375	-.0148322	.0393954
ldtotgen5	-.0103949	.0141981	-0.73	0.464	-.0382285	.0174387
ldtotgen6	-.0090506	.016817	-0.54	0.590	-.0420183	.0239171
ldtotgen7	.0161695	.0148068	1.09	0.275	-.0128575	.0451964
ldtotgen8	-.0504284	.0183806	-2.74	0.006	-.0864613	-.0143955
ldtotgen9	-.0542209	.0195283	-2.78	0.006	-.0925037	-.0159381
ldtotgen10	-.1444078	.0142261	-10.15	0.000	-.1722964	-.1165193
ldtotgen11	-.1515666	.014272	-10.62	0.000	-.1795451	-.1235881
drug2	3.443023	.0119551	288.00	0.000	3.419587	3.46646
drug3	-2.78537	.0120313	-231.51	0.000	-2.808955	-2.761784
drug4	.8871435	.254309	3.49	0.000	.3886021	1.385685
drug5	4.177795	.0130074	321.19	0.000	4.152295	4.203294
drug6	-.5944186	.0127104	-46.77	0.000	-.6193357	-.5695014
drug7	4.772518	.0124816	382.36	0.000	4.74805	4.796987
drug8	2.787629	.0298291	93.45	0.000	2.729153	2.846105
drug9	-1.033019	.02121	-48.70	0.000	-1.074598	-.991439
drug10	-.4641923	.0135078	-34.36	0.000	-.4906726	-.437712
drug11	-4.157622	.0165985	-250.48	0.000	-4.190161	-4.125082
drug12	-3.249803	.0121041	-268.49	0.000	-3.273532	-3.226075
drug13	-4.594584	.0232485	-197.63	0.000	-4.64016	-4.549008
drug14	-3.281638	.0116213	-282.38	0.000	-3.30442	-3.258855
drug15	-5.02474	.0119166	-421.66	0.000	-5.048101	-5.001379
drug16	-1.010392	.0123972	-81.50	0.000	-1.034695	-.9860886
drug17	-3.976778	.0154748	-256.98	0.000	-4.007115	-3.946442
drug18	-5.1956	.0131083	-396.36	0.000	-5.221297	-5.169903
drug19	-3.430759	.0178838	-191.84	0.000	-3.465818	-3.3957
drug20	-3.427962	.0466137	-73.54	0.000	-3.519343	-3.336582
drug21	-4.512938	.0148936	-303.01	0.000	-4.542135	-4.483741
drug22	-1.403388	.0134839	-104.08	0.000	-1.429822	-1.376955
drug23	-1.50797	.0122909	-122.69	0.000	-1.532064	-1.483875
drug24	.1683544	.0203481	8.27	0.000	.1284645	.2082443
drug25	-1.053521	.0173147	-60.85	0.000	-1.087464	-1.019577
drug26	-.9866719	.0322938	-30.55	0.000	-1.04998	-.9233638
drug27	-1.175967	.0275747	-42.65	0.000	-1.230024	-1.12191
drug28	-2.000148	.0160905	-124.31	0.000	-2.031692	-1.968605
drug29	-4.55561	.0160751	-283.40	0.000	-4.587123	-4.524097
drug30	.518353	.0133062	38.96	0.000	.4922678	.5444382
drug31	-3.144337	.0125647	-250.25	0.000	-3.168969	-3.119706
drug32	-2.914179	.0340491	-85.59	0.000	-2.980928	-2.84743
drug33	-2.937712	.0126092	-232.98	0.000	-2.962431	-2.912993
drug34	-4.136542	.0127273	-325.01	0.000	-4.161492	-4.111592
drug35	-4.523372	.0129657	-348.87	0.000	-4.54879	-4.497955
drug36	-.7342836	.0175511	-41.84	0.000	-.7686903	-.6998769
drug37	-.3127318	.0130472	-23.97	0.000	-.3383091	-.2871544
drug38	2.333579	.3960594	5.89	0.000	1.557153	3.110004
drug39	-1.920937	.0299719	-64.09	0.000	-1.979693	-1.862181
drug40	-.0587803	.0199623	-2.94	0.003	-.0979139	-.0196468
drug41	-.9551508	.0121437	-78.65	0.000	-.9789571	-.9313445
drug42	-3.961661	.0125784	-314.96	0.000	-3.98632	-3.937003
drug43	-3.385661	.0133355	-253.88	0.000	-3.411804	-3.359519
drug44	-4.028366	.0115795	-347.89	0.000	-4.051066	-4.005666
drug45	-4.085842	.0186397	-219.20	0.000	-4.122383	-4.049302

drug46	-.6634102	.0175194	-37.87	0.000	-.6977548	-.6290656
drug47	.1901531	.0208251	9.13	0.000	.149328	-.2309782
drug48	-4.210754	.0131806	-319.47	0.000	-4.236592	-4.184915
drug49	2.373001	.300763	7.89	0.000	1.783392	2.96261
drug50	-2.533266	.0145783	-173.77	0.000	-2.561845	-2.504687
drug51	-1.523197	.0147822	-103.04	0.000	-1.552176	-1.494219
drug52	1.1125	.0116452	95.53	0.000	1.089671	1.135329
drug53	-.5107356	.0122158	-41.81	0.000	-.5346832	-.486788
drug54	-.5167644	.0149592	-34.55	0.000	-.54609	-.4874388
drug55	-2.828496	.0220283	-128.40	0.000	-2.87168	-2.785312
drug56	1.526103	.0366979	41.59	0.000	1.454161	1.598044
drug57	-1.251718	.0118528	-105.61	0.000	-1.274954	-1.228482
drug58	2.71236	.013825	196.19	0.000	2.685258	2.739462
drug59	3.731453	.0126012	296.12	0.000	3.70675	3.756156
drug60	-4.701861	.0156983	-299.51	0.000	-4.732636	-4.671086
drug61	-3.291904	.0121288	-271.41	0.000	-3.315681	-3.268127
drug62	-3.304896	.0154808	-213.48	0.000	-3.335245	-3.274548
drug63	-.4201292	.0112669	-37.29	0.000	-.4422166	-.3980417
drug64	-4.851578	.0141414	-343.08	0.000	-4.879301	-4.823856
drug65	2.729626	.0946773	28.83	0.000	2.544022	2.915229
drug66	-.7026916	.0147765	-47.55	0.000	-.7316591	-.673724
drug67	3.306012	.0748868	44.15	0.000	3.159206	3.452819
drug68	-.7325962	.0125488	-58.38	0.000	-.7571965	-.7079958
drug69	-3.469357	.0156127	-222.21	0.000	-3.499964	-3.438751
drug70	-.1653174	.1174832	-1.41	0.159	-.3956287	.0649938
drug71	-1.839823	.0123729	-148.70	0.000	-1.864079	-1.815568
drug72	-.4708784	.0180187	-26.13	0.000	-.5062018	-.4355551
drug73	6.648509	.0417862	159.11	0.000	6.566592	6.730425
drug74	-2.431776	.0136561	-178.07	0.000	-2.458547	-2.405005
drug75	-2.057044	.0122784	-167.53	0.000	-2.081114	-2.032974
drug76	-3.620665	.0165256	-219.09	0.000	-3.653061	-3.588268
drug77	.1321015	.0173766	7.60	0.000	.0980367	.1661662
drug78	3.321275	.0201994	164.42	0.000	3.281677	3.360874
drug79	-3.862895	.012898	-299.49	0.000	-3.88818	-3.83761
drug80	-1.182473	.0115681	-102.22	0.000	-1.205151	-1.159796
drug81	-2.039128	.1068016	-19.09	0.000	-2.248499	-1.829757
drug82	-.2776742	.0168242	-16.50	0.000	-.3106559	-.2446924
drug83	2.25648	.1491759	15.13	0.000	1.964039	2.548921
_cons	-1.632606	.0114042	-143.16	0.000	-1.654963	-1.61025

Model 2.2

Model specification:

All drug markets used
 Indicators of contemporaneous AG generic market share
 Indicators of total number of generic drugs introduced
 Drug market specific indicators
 Quarter of year indicator variables dropped
 Robust standard error estimator used

Linear regression

Number of obs = 5851
 F(97, 5752) = .
 Prob > F = .
 R-squared = 0.9908
 Root MSE = .25123

lbap	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]
aggshare20	.0592315	.0183065	3.24	0.001	.0233438 .0951192
aggshare40	.0062601	.0128695	0.49	0.627	-.0189689 .0314891
aggshare60	-.0282474	.0124288	-2.27	0.023	-.0526126 -.0038822
aggshare80	-.0141399	.0129476	-1.09	0.275	-.039522 .0112422
aggshare100	.0054312	.0076125	0.71	0.476	-.0094921 .0203544
ldtotgen1	-.0100861	.0132183	-0.76	0.445	-.0359991 .0158268
ldtotgen2	-.0067755	.015004	-0.45	0.652	-.0361889 .022638
ldtotgen3	.0057101	.0190748	0.30	0.765	-.0316836 .0431038
ldtotgen4	.0088987	.0138991	0.64	0.522	-.0183487 .0361461
ldtotgen5	-.0141709	.0142154	-1.00	0.319	-.0420384 .0136966
ldtotgen6	-.0130531	.0168377	-0.78	0.438	-.0460614 .0199552
ldtotgen7	.0134816	.014795	0.91	0.362	-.0155221 .0424854
ldtotgen8	-.0550646	.0186456	-2.95	0.003	-.091617 -.0185121
ldtotgen9	-.0561901	.0193611	-2.90	0.004	-.0941452 -.0182351
ldtotgen10	-.1450488	.0141548	-10.25	0.000	-.1727976 -.1173001
ldtotgen11	-.1522076	.0142009	-10.72	0.000	-.1800468 -.1243684
drug2	3.442466	.0119284	288.59	0.000	3.419082 3.46585
drug3	-2.786113	.0119956	-232.26	0.000	-2.809629 -2.762597
drug4	.8879709	.2542008	3.49	0.000	.3896416 1.3863
drug5	4.178041	.0130015	321.35	0.000	4.152553 4.203528
drug6	-.5943994	.0126915	-46.83	0.000	-.6192796 -.5695192
drug7	4.773935	.0124452	383.60	0.000	4.749537 4.798332
drug8	2.788192	.0298577	93.38	0.000	2.72966 2.846724
drug9	-1.031263	.0211926	-48.66	0.000	-1.072809 -.9897177
drug10	-.4639415	.0134462	-34.50	0.000	-.4903011 -.4375818
drug11	-4.158651	.0165107	-251.88	0.000	-4.191018 -4.126284
drug12	-3.250154	.0120758	-269.15	0.000	-3.273827 -3.226481
drug13	-4.594822	.0232318	-197.78	0.000	-4.640365 -4.549279
drug14	-3.282542	.0116076	-282.79	0.000	-3.305298 -3.259787
drug15	-5.024979	.0118839	-422.84	0.000	-5.048275 -5.001682
drug16	-1.011457	.0124557	-81.20	0.000	-1.035875 -.987039
drug17	-3.978743	.0155905	-255.20	0.000	-4.009306 -3.948179
drug18	-5.196694	.0131216	-396.04	0.000	-5.222417 -5.170971
drug19	-3.430486	.0179454	-191.16	0.000	-3.465666 -3.395306
drug20	-3.426815	.0466619	-73.51	0.000	-3.518205 -3.335424
drug21	-4.513176	.0148674	-303.56	0.000	-4.542322 -4.484031
drug22	-1.405081	.0134423	-104.53	0.000	-1.431433 -1.378729
drug23	-1.507983	.0122557	-123.04	0.000	-1.532009 -1.483957
drug24	.1684679	.0203503	8.28	0.000	.1285737 .2083621
drug25	-1.050998	.0171821	-61.17	0.000	-1.084682 -1.017315
drug26	-.98691	.0322818	-30.57	0.000	-1.050194 -.9236255
drug27	-1.176205	.0275606	-42.68	0.000	-1.230234 -1.122176
drug28	-1.999859	.0160892	-124.30	0.000	-2.0314 -1.968318
drug29	-4.555773	.0161725	-281.70	0.000	-4.587478 -4.524069
drug30	.5181748	.0132948	38.98	0.000	.4921119 .5442376
drug31	-3.144468	.0125315	-250.93	0.000	-3.169034 -3.119901
drug32	-2.913331	.0340726	-85.50	0.000	-2.980126 -2.846536
drug33	-2.939117	.0126288	-232.73	0.000	-2.963874 -2.91436
drug34	-4.136018	.0126961	-325.77	0.000	-4.160907 -4.111128
drug35	-4.52335	.0129248	-349.97	0.000	-4.548688 -4.498013
drug36	-.7350727	.0175793	-41.81	0.000	-.7695347 -.7006107
drug37	-.3138176	.0130839	-23.99	0.000	-.339467 -.2881682
drug38	2.333415	.3960793	5.89	0.000	1.556951 3.10988
drug39	-1.921175	.0299589	-64.13	0.000	-1.979906 -1.862444
drug40	-.0587317	.0199222	-2.95	0.003	-.0977867 -.0196766
drug41	-.9562732	.0121807	-78.51	0.000	-.9801519 -.9323944
drug42	-3.961262	.0125253	-316.26	0.000	-3.985816 -3.936707
drug43	-3.389328	.0134725	-251.57	0.000	-3.415739 -3.362917
drug44	-4.028348	.0115498	-348.78	0.000	-4.05099 -4.005706
drug45	-4.085555	.0185763	-219.93	0.000	-4.121972 -4.049138
drug46	-.6618385	.0174958	-37.83	0.000	-.6961368 -.6275402
drug47	.1908353	.0207812	9.18	0.000	.1500963 .2315742

drug48	-4.210624	.0131619	-319.91	0.000	-4.236426	-4.184822
drug49	2.373011	.3007433	7.89	0.000	1.783441	2.962581
drug50	-2.534737	.0145965	-173.65	0.000	-2.563352	-2.506123
drug51	-1.523435	.0147558	-103.24	0.000	-1.552362	-1.494508
drug52	1.112289	.011611	95.80	0.000	1.089527	1.135051
drug53	-.5106332	.0121877	-41.90	0.000	-.5345257	-.4867407
drug54	-.5183452	.0151536	-34.21	0.000	-.548052	-.4886383
drug55	-2.828498	.0220224	-128.44	0.000	-2.87167	-2.785326
drug56	1.528136	.0367543	41.58	0.000	1.456084	1.600189
drug57	-1.251521	.0118013	-106.05	0.000	-1.274656	-1.228386
drug58	2.711862	.0138427	195.91	0.000	2.684725	2.738999
drug59	3.731509	.0125955	296.26	0.000	3.706817	3.756201
drug60	-4.70016	.0156604	-300.13	0.000	-4.73086	-4.66946
drug61	-3.293955	.0120981	-272.27	0.000	-3.317671	-3.270238
drug62	-3.302438	.0154613	-213.59	0.000	-3.332748	-3.272128
drug63	-.4202777	.011229	-37.43	0.000	-.4422908	-.3982645
drug64	-4.851241	.0141103	-343.81	0.000	-4.878902	-4.823579
drug65	2.728047	.0945052	28.87	0.000	2.542781	2.913313
drug66	-.7030711	.014791	-47.53	0.000	-.7320671	-.6740751
drug67	3.305774	.0748816	44.15	0.000	3.158978	3.45257
drug68	-.7331843	.0125502	-58.42	0.000	-.7577875	-.7085812
drug69	-3.470705	.0155486	-223.22	0.000	-3.501186	-3.440224
drug70	-.1642891	.1175132	-1.40	0.162	-.3946592	.066081
drug71	-1.841538	.0124017	-148.49	0.000	-1.86585	-1.817226
drug72	-.4704755	.0179335	-26.23	0.000	-.5056319	-.4353191
drug73	6.648656	.0417843	159.12	0.000	6.566743	6.730569
drug74	-2.43209	.0136364	-178.35	0.000	-2.458823	-2.405358
drug75	-2.057273	.0122463	-167.99	0.000	-2.08128	-2.033266
drug76	-3.618214	.0165023	-219.26	0.000	-3.650564	-3.585863
drug77	.1318634	.0173543	7.60	0.000	.0978425	.1658842
drug78	3.321118	.020179	164.58	0.000	3.281559	3.360676
drug79	-3.862918	.0128729	-300.08	0.000	-3.888153	-3.837682
drug80	-1.182712	.0115345	-102.54	0.000	-1.205323	-1.1601
drug81	-2.037566	.1068212	-19.07	0.000	-2.246976	-1.828156
drug82	-.2766855	.0167567	-16.51	0.000	-.3095348	-.2438361
drug83	2.256242	.1491733	15.12	0.000	1.963806	2.548678
_cons	-1.632368	.01137	-143.57	0.000	-1.654658	-1.610079

Model 2.3

Model specification:

Drug markets with apparent measurement error removed
 Indicators of one period lagged AG generic market share
 Indicators of total number of generic drugs introduced
 Drug market specific indicators
 Quarter of year indicator variables dropped
 Robust standard error estimator used

Linear regression

Number of obs = 4919
 F(78, 4839) = .
 Prob > F = .
 R-squared = 0.9981
 Root MSE = .11283

lbap	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
laggshare20	.0756729	.0178476	4.24	0.000	.0406835	.1106624
laggshare40	.0238561	.0102227	2.33	0.020	.003815	.0438972
laggshare60	-.0166727	.0084813	-1.97	0.049	-.0332999	-.0000456
laggshare80	-.0133237	.0093263	-1.43	0.153	-.0316074	.00496
laggshare100	.0143089	.0067084	2.13	0.033	.0011574	.0274604
ldtotgen1	-.0129131	.0064376	-2.01	0.045	-.0255336	-.0002925
ldtotgen2	-.0235389	.0082889	-2.84	0.005	-.0397889	-.007289
ldtotgen3	-.0164033	.0090347	-1.82	0.069	-.0341155	.0013089
ldtotgen4	-.0042068	.0109803	-0.38	0.702	-.0257332	.0173195
ldtotgen5	-.0295492	.0114328	-2.58	0.010	-.0519626	-.0071358
ldtotgen6	-.0289591	.0148404	-1.95	0.051	-.058053	.0001349
ldtotgen7	-.0019183	.0124794	-0.15	0.878	-.0263837	.0225471
ldtotgen8	-.0679157	.0171667	-3.96	0.000	-.1015702	-.0342611
ldtotgen9	-.0696698	.0185645	-3.75	0.000	-.1060647	-.033275
ldtotgen10	-.1486249	.0135951	-10.93	0.000	-.1752776	-.1219723
ldtotgen11	-.1557837	.0136431	-11.42	0.000	-.1825304	-.129037
drug2	3.43999	.0116159	296.15	0.000	3.417218	3.462762
drug3	-2.785868	.0116506	-239.12	0.000	-2.808709	-2.763028
drug4	(dropped)					
drug5	4.178393	.0116119	359.84	0.000	4.155628	4.201158
drug6	-.5945569	.012515	-47.51	0.000	-.619092	-.5700217
drug7	4.77054	.0121567	392.42	0.000	4.746707	4.794373
drug8	2.792774	.0298692	93.50	0.000	2.734217	2.851331
drug9	-1.014878	.0187297	-54.19	0.000	-1.051597	-.9781592
drug10	-.4621227	.0129461	-35.70	0.000	-.4875029	-.4367425
drug11	-4.166495	.0162408	-256.54	0.000	-4.198334	-4.134655
drug12	-3.255568	.0114845	-283.48	0.000	-3.278082	-3.233053
drug13	(dropped)					
drug14	-3.283397	.0111274	-295.07	0.000	-3.305212	-3.261583
drug15	(dropped)					
drug16	-1.012263	.0119551	-84.67	0.000	-1.035701	-.9888261
drug17	-3.981256	.0152976	-260.25	0.000	-4.011247	-3.951266
drug18	(dropped)					
drug19	-3.428771	.0169723	-202.02	0.000	-3.462045	-3.395498
drug20	(dropped)					
drug21	(dropped)					
drug22	-1.408704	.012745	-110.53	0.000	-1.43369	-1.383718
drug23	-1.508151	.0120366	-125.30	0.000	-1.531748	-1.484554
drug24	.1683176	.0200038	8.41	0.000	.1291012	.2075341
drug25	-1.057252	.0162659	-65.00	0.000	-1.089141	-1.025364
drug26	(dropped)					
drug27	(dropped)					
drug28	-1.999341	.0147253	-135.78	0.000	-2.028209	-1.970473
drug29	-4.555908	.0154598	-294.69	0.000	-4.586216	-4.5256
drug30	.5198893	.0130207	39.93	0.000	.4943627	.5454158
drug31	-3.145546	.0122775	-256.20	0.000	-3.169615	-3.121476
drug32	(dropped)					
drug33	-2.94066	.0123224	-238.64	0.000	-2.964817	-2.916502
drug34	-4.130733	.0119245	-346.41	0.000	-4.15411	-4.107356
drug35	-4.523849	.012514	-361.50	0.000	-4.548383	-4.499316
drug36	-.732393	.016593	-44.14	0.000	-.7649228	-.6998632
drug37	-.3123926	.0126404	-24.71	0.000	-.3371736	-.2876116
drug38	(dropped)					
drug39	(dropped)					
drug40	-.0591285	.0195548	-3.02	0.003	-.0974648	-.0207921
drug41	-.9580241	.0118813	-80.63	0.000	-.9813169	-.9347313
drug42	-3.96134	.0119495	-331.51	0.000	-3.984767	-3.937914
drug43	-3.384157	.0126728	-267.04	0.000	-3.409001	-3.359312
drug44	-4.028499	.0113275	-355.64	0.000	-4.050706	-4.006292
drug45	-4.083764	.017866	-228.58	0.000	-4.11879	-4.048739
drug46	-.6470645	.0146014	-44.32	0.000	-.67569	-.618439
drug47	(dropped)					

drug48	-4.210715	.0124587	-337.97	0.000	-4.235139	-4.18629
drug49	(dropped)					
drug50	-2.536578	.0144018	-176.13	0.000	-2.564812	-2.508344
drug51	(dropped)					
drug52	1.110905	.0112006	99.18	0.000	1.088947	1.132864
drug53	-.5108256	.0115239	-44.33	0.000	-.5334178	-.4882334
drug54	-.5185916	.014643	-35.42	0.000	-.5472985	-.4898847
drug55	-2.829089	.0218694	-129.36	0.000	-2.871963	-2.786215
drug56	1.538604	.036154	42.56	0.000	1.467726	1.609483
drug57	-1.249777	.0114334	-109.31	0.000	-1.272192	-1.227363
drug58	2.710737	.013002	208.49	0.000	2.685248	2.736227
drug59	3.728449	.0121478	306.92	0.000	3.704634	3.752264
drug60	-4.688074	.0126809	-369.70	0.000	-4.712934	-4.663214
drug61	-3.295076	.0118356	-278.40	0.000	-3.31828	-3.271873
drug62	-3.291243	.0139743	-235.52	0.000	-3.318639	-3.263847
drug63	-.4214237	.0109231	-38.58	0.000	-.4428379	-.4000096
drug64	-4.848445	.0137098	-353.65	0.000	-4.875322	-4.821567
drug65	2.725683	.0939921	29.00	0.000	2.541416	2.90995
drug66	-.7043099	.014367	-49.02	0.000	-.7324757	-.676144
drug67	(dropped)					
drug68	-.7346175	.0120173	-61.13	0.000	-.7581769	-.7110581
drug69	-3.473583	.0150818	-230.32	0.000	-3.50315	-3.444016
drug70	(dropped)					
drug71	-1.845075	.0120302	-153.37	0.000	-1.868659	-1.82149
drug72	-.4683861	.0173672	-26.97	0.000	-.5024337	-.4343384
drug73	6.648635	.0415339	160.08	0.000	6.56721	6.730061
drug74	-2.429491	.0123522	-196.68	0.000	-2.453707	-2.405275
drug75	-2.058726	.0118078	-174.35	0.000	-2.081874	-2.035577
drug76	-3.604807	.0148759	-242.32	0.000	-3.63397	-3.575643
drug77	(dropped)					
drug78	3.319938	.0200022	165.98	0.000	3.280724	3.359151
drug79	-3.863587	.012612	-306.34	0.000	-3.888312	-3.838862
drug80	-1.184198	.0110403	-107.26	0.000	-1.205842	-1.162554
drug81	(dropped)					
drug82	-.2671934	.0153518	-17.40	0.000	-.2972898	-.237097
drug83	(dropped)					
_cons	-1.630881	.0108685	-150.06	0.000	-1.652189	-1.609574

Model 2.4

Model specification:

Drug markets with apparent measurement error removed
 Indicators of contemporaneous AG generic market share
 Indicators of total number of generic drugs introduced
 Drug market specific indicators
 Quarter of year indicator variables dropped
 Robust standard error estimator used

Linear regression

Number of obs = 4919
 F(78, 4839) = .
 Prob > F = .
 R-squared = 0.9981
 Root MSE = .11278

lbap	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
aggshare20	.0786967	.0178285	4.41	0.000	.0437449	.1136486
aggshare40	.0273265	.0101583	2.69	0.007	.0074117	.0472413
aggshare60	-.0151976	.0085613	-1.78	0.076	-.0319817	.0015865
aggshare80	-.0029807	.0092351	-0.32	0.747	-.0210857	.0151244
aggshare100	.0085505	.0060746	1.41	0.159	-.0033584	.0204595
ldtotgen1	-.0137173	.0064977	-2.11	0.035	-.0264558	-.0009788
ldtotgen2	-.0257415	.0083336	-3.09	0.002	-.0420791	-.0094038
ldtotgen3	-.0190002	.0090727	-2.09	0.036	-.0367868	-.0012136
ldtotgen4	-.0078155	.0110741	-0.71	0.480	-.0295258	.0138948
ldtotgen5	-.0332709	.0115262	-2.89	0.004	-.0558676	-.0106742
ldtotgen6	-.0326297	.0149438	-2.18	0.029	-.0619264	-.0033331
ldtotgen7	-.0045479	.0124976	-0.36	0.716	-.0290488	.019953
ldtotgen8	-.072115	.0175386	-4.11	0.000	-.1064985	-.0377314
ldtotgen9	-.071189	.0184343	-3.86	0.000	-.1073286	-.0350494
ldtotgen10	-.1492701	.0135273	-11.03	0.000	-.1757897	-.1227505
ldtotgen11	-.1564288	.0135755	-11.52	0.000	-.183043	-.1298147
drug2	3.43938	.0115862	296.85	0.000	3.416665	3.462094
drug3	-2.786948	.0116046	-240.16	0.000	-2.809699	-2.764198
drug4	(dropped)					
drug5	4.178648	.0115802	360.84	0.000	4.155945	4.201351
drug6	-.5945404	.0124973	-47.57	0.000	-.6190409	-.5700399
drug7	4.77208	.012129	393.44	0.000	4.748302	4.795859
drug8	2.793428	.0299033	93.42	0.000	2.734804	2.852052
drug9	-1.012869	.018719	-54.11	0.000	-1.049567	-.9761711
drug10	-.4618743	.0128872	-35.84	0.000	-.4871391	-.4366095
drug11	-4.167593	.016176	-257.64	0.000	-4.199305	-4.13588
drug12	-3.256039	.0114532	-284.29	0.000	-3.278492	-3.233585
drug13	(dropped)					
drug14	-3.284561	.0111003	-295.90	0.000	-3.306322	-3.262799
drug15	(dropped)					
drug16	-1.01364	.0120247	-84.30	0.000	-1.037213	-.9900656
drug17	-3.983351	.0154049	-258.58	0.000	-4.013552	-3.95315
drug18	(dropped)					
drug19	-3.428582	.016972	-202.01	0.000	-3.461855	-3.395309
drug20	(dropped)					
drug21	(dropped)					
drug22	-1.410682	.0127428	-110.70	0.000	-1.435664	-1.3857
drug23	-1.508168	.0120007	-125.67	0.000	-1.531695	-1.484641
drug24	.1684294	.0200017	8.42	0.000	.129217	.2076418
drug25	-1.054527	.0162051	-65.07	0.000	-1.086296	-1.022758
drug26	(dropped)					
drug27	(dropped)					
drug28	-1.999039	.0146987	-136.00	0.000	-2.027855	-1.970223
drug29	-4.556236	.0154942	-294.06	0.000	-4.586612	-4.525861
drug30	.5196418	.0130281	39.89	0.000	.4941008	.5451827
drug31	-3.145698	.0122416	-256.97	0.000	-3.169697	-3.121699
drug32	(dropped)					
drug33	-2.942223	.0123201	-238.81	0.000	-2.966376	-2.91807
drug34	-4.130178	.011909	-346.81	0.000	-4.153525	-4.106831
drug35	-4.523837	.0124671	-362.86	0.000	-4.548278	-4.499396
drug36	-.7332619	.016628	-44.10	0.000	-.7658604	-.7006634
drug37	-.3135471	.0126824	-24.72	0.000	-.3384102	-.2886839
drug38	(dropped)					
drug39	(dropped)					
drug40	-.0590867	.019509	-3.03	0.002	-.0973333	-.0208402
drug41	-.9593793	.0119244	-80.46	0.000	-.9827566	-.9360021
drug42	-3.960946	.0118898	-333.14	0.000	-3.984255	-3.937637
drug43	-3.387587	.0127182	-266.36	0.000	-3.41252	-3.362653
drug44	-4.028484	.0112973	-356.59	0.000	-4.050632	-4.006336
drug45	-4.08344	.0177896	-229.54	0.000	-4.118316	-4.048564
drug46	-.6452372	.0145906	-44.22	0.000	-.6738414	-.6166331
drug47	(dropped)					

drug48	-4.210586	.0124284	-338.79	0.000	-4.234951	-4.18622
drug49	(dropped)					
drug50	-2.53818	.0144221	-175.99	0.000	-2.566454	-2.509906
drug51	(dropped)					
drug52	1.110666	.0111598	99.52	0.000	1.088788	1.132544
drug53	-.5107257	.0114848	-44.47	0.000	-.5332412	-.4882103
drug54	-.5205542	.0148523	-35.05	0.000	-.5496713	-.491437
drug55	-2.829102	.0218629	-129.40	0.000	-2.871963	-2.786241
drug56	1.54077	.0362169	42.54	0.000	1.469768	1.611771
drug57	-1.249547	.0113895	-109.71	0.000	-1.271875	-1.227218
drug58	2.710042	.0129813	208.76	0.000	2.684593	2.735492
drug59	3.728328	.0121185	307.66	0.000	3.70457	3.752086
drug60	-4.686283	.0126601	-370.16	0.000	-4.711103	-4.661464
drug61	-3.297348	.0117804	-279.90	0.000	-3.320443	-3.274253
drug62	-3.28866	.0139798	-235.24	0.000	-3.316066	-3.261253
drug63	-.4215952	.0108812	-38.75	0.000	-.4429274	-.400263
drug64	-4.848051	.0136785	-354.43	0.000	-4.874867	-4.821235
drug65	2.723817	.0937909	29.04	0.000	2.539944	2.90769
drug66	-.7050047	.0143435	-49.15	0.000	-.7331246	-.6768849
drug67	(dropped)					
drug68	-.7354118	.0119952	-61.31	0.000	-.7589278	-.7118958
drug69	-3.475145	.0149888	-231.85	0.000	-3.50453	-3.44576
drug70	(dropped)					
drug71	-1.847103	.0120418	-153.39	0.000	-1.87071	-1.823495
drug72	-.4680093	.0172819	-27.08	0.000	-.5018896	-.434129
drug73	6.648784	.041529	160.10	0.000	6.567368	6.7302
drug74	-2.42986	.0122881	-197.74	0.000	-2.45395	-2.405769
drug75	-2.058984	.0117681	-174.96	0.000	-2.082055	-2.035913
drug76	-3.602403	.0148933	-241.88	0.000	-3.631601	-3.573206
drug77	(dropped)					
drug78	3.319756	.0199801	166.15	0.000	3.280586	3.358927
drug79	-3.863623	.0125847	-307.01	0.000	-3.888294	-3.838951
drug80	-1.184467	.0109976	-107.70	0.000	-1.206027	-1.162906
drug81	(dropped)					
drug82	-.2660906	.0152957	-17.40	0.000	-.2960771	-.2361041
drug83	(dropped)					
_cons	-1.630613	.0108252	-150.63	0.000	-1.651835	-1.609391

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