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Market power and state costs of HIV/AIDS drugs

Arleen A. Leibowitz · Neeraj Sood

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Abstract We examine whether U.S. states can use their market power to reduce the costs of supplying prescription drugs to uninsured and underinsured persons with HIV through a public program, the AIDS Drug Assistance Program (ADAP). Among states that purchase drugs from manufacturers and distribute them directly to clients, those that purchase a greater volume pay lower average costs per prescription. Among states depending on retail pharmacies to distribute drugs and then claiming rebates from manufacturers, those that contract with smaller numbers of pharmacy networks have lower average costs. Average costs per prescription do not differ between the two purchase methods.

Keywords Market power · State pharmaceutical costs · HIV/AIDS drugs · AIDS drug assistance program

Introduction

The AIDS Drug Assistance Program (ADAP) is the payer of last resort for HIV-related prescription drugs to underinsured and uninsured persons living with HIV (PLH) in the United States. Congress first authorized funds for AIDS medications in 1987, and the program was later incorporated into Title II of the Ryan White Comprehensive AIDS Resources Emergency Act (CARE) in 1990 as the AIDS Drug Assistance Program. ADAP is not an entitlement program, in which federal funding is available for all individuals who meet the eligibility criteria. Rather, the federal funding is in the form of a block grant and states have the option to

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supplement their Title II ADAP Earmark allocation with other federal CARE Act revenues, state general revenue funds and rebates from drug manufacturers.

States also have latitude in how they organize the purchase of drugs, in which drugs they include in the formulary, and in determining financial eligibility criteria for who gets served. Not surprisingly, there is wide variation in how states manage their ADAP program. For example, Maryland, Massachusetts, New Jersey, and Ohio cover PLH with incomes up to five times the Federal Poverty Level (FPL). In contrast, North Carolina sets its financial eligibility ceiling at 125% of the FPL (Kates, Penner, Crutsinger-Perry, Carbaugh, & Singleton 2006). States have also adopted different mechanisms for purchasing ADAP drugs. Thirty state or territorial programs currently negotiate discounts from list prices directly with pharmaceutical manufacturers; 24 others compensate retail pharmacies for supplying medications to patients and then apply for rebates from the manufacturers (Kates et al., 2006).

ADAP programs in most states currently face a number of significant challenges. Beginning in 2001, the economic downturn reduced state tax revenues and put financial pressure on state contributions to ADAP programs. At the same time, the number of persons seeking ADAP services continues to rise. Although the number of new AIDS cases reported in the U.S. grew 15 % (from 40,000 to 46,000 per year) between 2001 and 2005 (CDC, 2005), the number of persons living with AIDS increased at a nearly double that rate because of the new prescription drugs for HIV that led to dramatic declines in AIDS mortality. The CDC (2005) reports that the number of people living with AIDS grew from 341,000 to 438,000 between 2001 and 2005. Antiretroviral medications (ARVs) have also forestalled disability and thereby reduced eligibility for the Medicaid program. Thus, greater numbers of people living with HIV are seeking out the ADAP program for assistance in paying for HIV medications. ADAP enrollment currently accounts for approximately one-quarter of the estimated 550,000 persons in care for HIV/AIDS in the US (Kates et al., 2006).

The pressure of falling budgets and rising demand for services has been exacerbated by the rise in costs of prescription drugs and the introduction of new, more costly ARVs. Spending on prescription drugs has emerged as a major cost-driver for both public and private health plans. Most prescription drugs for treating HIV are still protected by patents and their costs are high. Effective HIV treatment typically requires a combination of three or more drugs, which cost state ADAPS an average of \$1064/client a month in 2005, or \$12,768 annually (Kates et al., 2006). The costs of newer therapies, such as Fuzeon, which retails for nearly \$20,000 per year, are likely to increase average annual treatment costs even further.

Many states caught in the squeeze between falling state revenues and increasing demands for ADAP assistance have responded by instituting waiting lists for ADAP enrollment or by lowering financial eligibility criteria for the program. Other states have attempted to lower costs by reducing the numbers of drugs on their formularies or by capping expenditures per client per year.

This naturally raises the question: Are there avenues for reducing ADAP costs without severely affecting access to the program or the generosity of its coverage? One approach, taken by 39 states, is to use rebates on pharmaceutical purchases from drug manufacturers to supplement federal and state ADAP allocations (Kates et al., 2006). Rebate revenues now contribute 15% of ADAP budgets (Kates et al., 2006). In this paper we examine empirically the extent to which states can use their market power to reduce the average cost of purchasing AIDS drugs through the ADAP program. We use administrative data to test several hypotheses about the effect of states' market power and organizational form of the ADAP program on average drug costs.

The next section describes some important characteristics of the pharmaceutical market in the US and the alternate ADAP models that different states have adopted for purchasing

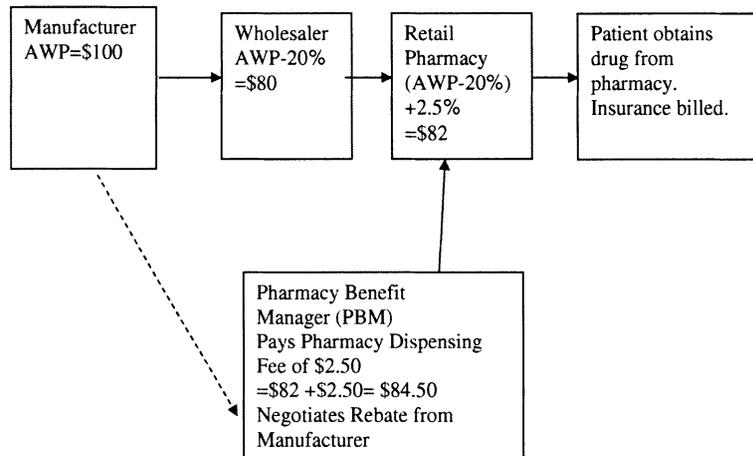


Fig. 1 Supply chain for pharmaceuticals

drugs. Our empirical strategy is presented in the following section. Results and conclusions drawn from the empirical work are presented in the final section.

ADAP and the market for pharmaceuticals

The market for pharmaceuticals

The market for pharmaceuticals deviates substantially from the purely competitive model of microeconomics (Berndt 2002; Scherer 2000). Lack of a competitive market is especially salient in the area of HIV medications, most of which have been developed recently and are still under patent protection. The result is that manufacturers set prices well above the marginal costs of producing the medications. One measure of the marginal cost of ARVs is the cost in developing countries for a year's supply of the three drugs required for combination therapy, which is as little as \$140 (Clinton Foundation 2006). In contrast, this therapy costs approximately \$10,000 – \$15,000 annually in the US (US GAO 1998; cited in Berwick 2002) because patent enforcement prevents price competition that would reduce the price closer to the marginal cost.

As is the case with manufacturers of brand name drugs, generally, manufacturers enjoy wide profit margins and typically give discounts and rebates to preferred purchasers. Figure 1 shows the stages in the supply chain for a typical brand name drug and shows that discounts and rebates are available at several points in the supply chain between the manufacturer and the retail pharmacy. Manufacturers typically sell drugs to wholesalers at a discount of about 20 % below the wholesale list price or average wholesale price (AWP) (Frank 2001). The actual transaction price is known as average manufacturers' price (AMP) and is generally lower than wholesale list price.

The wholesale firms in turn supply retail pharmacies, charging a dispensing fee over and above the price they paid for the drugs. Pharmacies base the price they charge retail customers on the AWP. As shown in Fig. 1, the price faced by a person without insurance would typically be about 4% above AWP. However, the retail pharmacies' profit is substantially higher than 4%, because they purchased the drugs at a discount below the AWP. Because retail pharmacies are earning substantial profits at the price they charge customers without insurance, they

are willing to supply certain large purchasers at lower prices. In particular, pharmacy benefit managers (PBMs) are able to negotiate substantial discounts with retail pharmacies if they can promise the retailers greater volume. PBMs negotiate exclusive contracts with particular pharmacy chains to gain price discounts for the groups of insured individuals they represent. Thus, most commercial health insurance policies in the US currently provide coverage for medications purchased through specific pharmacies or by mail order. PBMs extract some of the retail pharmacy profit and pass it on to the insured individuals. PBMs may also obtain rebates of 5 – 35% directly from the manufacturers, based on the volume of purchases for the manufacturer's drugs.

ADAP models

State ADAPs, which are large purchasers of certain drugs, are able to obtain discounts and rebates on their drug purchases using one of two mechanisms: the rebate model or the direct purchase model (also known as the point of purchase program).

Rebate model

The Veteran's Health Care Act of 1992 requires pharmaceutical manufacturers who wish to receive Medicaid matching funds to charge no more than a specified ceiling price for covered outpatient drugs to Medicaid and certain other public health providers. This ceiling price is calculated by applying a Medicaid rebate percentage (15.1 %) to the AMP, which is the actual price that manufacturers charge wholesalers. This "Section 340b Drug Discount Program" allows Ryan White CARE Act grantees, including ADAPs, to obtain rebates on their drug spending from manufacturers of at least 15.1%, and sometimes more (Richardson, n.d.). The rebate is negotiated with the federal government, and neither the rebate amount nor the AMP for a particular medication varies across states.

Figure 2 illustrates how the typical state ADAP rebate program works. States participating in the rebate program rely on retail pharmacies to distribute the medications. The state's PBM negotiates with the pharmacies to obtain a lower price than a retail customer without insurance would pay. The state ADAP program compensates its PBM for the medications at a negotiated discounted price, usually based on AWP, thereby capturing some of the discount the PBM has received from the retail pharmacy. The state then requests a rebate directly from the manufacturer, based on the 340b rebate and the state's sales volume.

Direct purchase model

Alternatively, state ADAPs can use the direct purchase or point of purchase system. In this model, manufacturers agree to provide medication at a discounted price directly to the state, thus obviating the need to apply for a rebate. Because they do not rely on retail pharmacies for distribution, states purchase drugs centrally through a State pharmacy, PBM, or a public agency/hospital and must arrange for distributing the drugs. Beginning in 1999, direct purchase states could use the Prime Vendor program, which is a wholesaler contracted by the federal government, but paid by states, to negotiate with the pharmaceutical manufacturers on behalf of a number of states. The Prime Vendor also assumes the responsibility for distributing medication to patients in the states with which it contracts.¹

¹ Several states did not participate in the 340b program through either rebate or direct purchase options in 2003. Since these states negotiated directly for pharmaceutical purchases, they were classified with the direct purchase states.

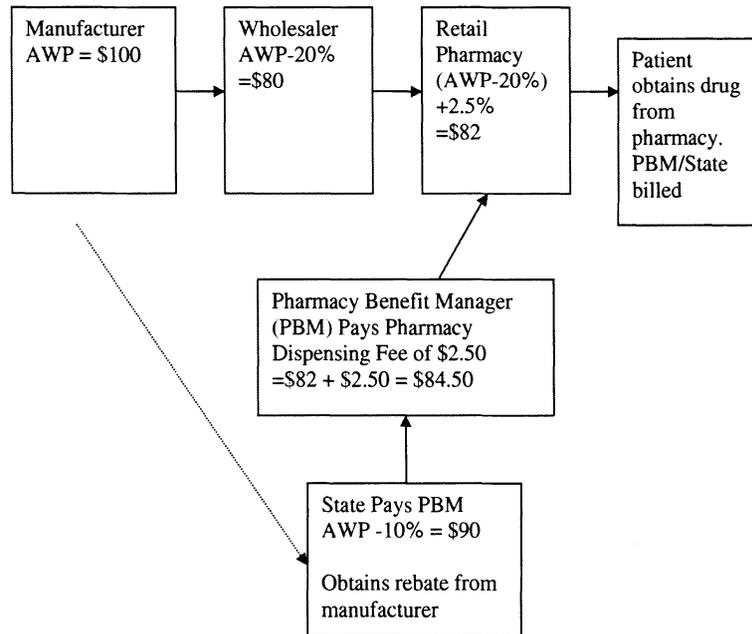


Fig. 2 Model of ADAP pharmaceutical purchase in rebate states

The ability to negotiate rebates directly from pharmaceutical companies depends on having a credible threat of reducing drug purchases from a given manufacturer. Substitutability within the class of ARV drugs provides states and the Prime Vendor some leverage. For example, several states with large ADAP programs refused to include efavirenz (Sustiva) in their formularies when DuPont introduced it at a price higher than other ARVs (Grinberg, 1998). More generally, however, states encourage the use of “cheaper” ARVs by requiring prior authorization for the more expensive drugs.

Recent developments

In 2003, The ADAP Crisis Task Force comprised of representatives of the largest state ADAP programs negotiated with the eight pharmaceutical companies that manufacture ARVs and were able to obtain additional discounts for all states, whether they were rebate or direct purchase.

Hypotheses

During the period under study, all the HAART drugs were protected by patents and each was sold by a single manufacturer in US markets. Price variation across direct purchase states could arise due to states’ differential abilities to obtain discounts from pharmaceutical manufacturers and their net costs of distributing the drugs, for which direct purchase states are responsible. In contrast, all rebate states obtained identical 340b rebates on drugs whose list prices did not vary across the states. Any differences in average costs per drug across rebate states must relate to the state costs of running the program, including their contractual arrangements with PBMs or discounts they receive from retail pharmacies.

The fact that some state ADAPs use the rebate method and others use the direct purchase method with discounts, allows us to test which strategy allows state ADAP programs to purchase drugs at the lowest prices and to examine program characteristics that promote lower costs. We formulated four hypotheses about the ability of different types of ADAP models to achieve lower net prices for drug purchases:

H₁: *Direct purchase model ADAPs purchase medication at lower cost than rebate model ADAPs* because they negotiate directly with the manufacturers and distribute the drugs themselves, thus possibly negotiating greater discounts than the Federal government negotiates through the 340b program on behalf of all Medicaid and public health providers. Additionally, by taking on the distribution task, a state might be able to further lower costs by squeezing out the profit margins of the retail pharmacies and by using mail order delivery.

H₂: *Within the direct purchase model, those states negotiating for larger drug volume achieve lower average costs* because manufacturers are willing to give greater discounts to states with greater market power. In contrast, the average ARV costs in rebate states should not be related to a given state's market power, since the rebate amounts are negotiated with the federal government rather than individual states.

H₃: *Rebate states providing larger numbers of prescriptions have lower per prescription costs* than rebate states with smaller markets, due to economies of scale in administering the program. The fixed costs of running an ADAP program mean that a greater volume of purchases results in lower average costs. In rebate states, the purchasing volume should have a smaller effect on average costs than in direct purchase states, where large volume purchasers have two mechanisms for lowering average costs: market power and economies of scale.

H₄: *Rebate states that contract with a small, restricted number of pharmacies for distribution should achieve lower average drug costs* because they can use their market power to obtain discounts from the retail pharmacies in exchange for giving the chosen pharmacy a larger share of the purchases. Although the discounts would likely be negotiated by the states' PBMs, some of these cost savings should be passed on to ADAP programs. Thus, we expect to observe lower costs per unit in states with smaller networks.

Methods

In order to determine how the alternate models for organizing ADAPs affect the cost of prescriptions, our empirical strategy is to compare costs across states employing different ADAP models. In order to accomplish this, we first determined which states used the various models and assembled comparable cost data across states. We then adjusted drug purchase cost data to make them commensurate. Finally, we used multivariate statistical methods to estimate the relationship between costs and ADAP models. We discuss each of these in the next three subsections.

State ADAP models

We constructed data on ADAP models for the period 2000–2003 using data from the website of the Health Resources and Services Administration (HRSA) (www.hrsa.gov) and from reports produced by the National Alliance of State and Territorial AIDS Directors (NAS-TAD) (Kates, Murray, Crutsinger-Perry, Leggoe, & Singleton 2005; Davis et al., 2003). We contacted state ADAP programs directly and consulted with HRSA officials, NASTAD and the Prime Vendor to resolve any inconsistencies.

ADAP programs were characterized as Direct Purchase or Rebate. Within Direct Purchase we distinguished programs where the state or PBM was the agent versus programs that contracted with the Prime Vendor. Among the rebate states, we distinguished those that contracted with a large number or a restricted number of pharmacies. Several states that did not use the 340b option might also be categorized as employing Direct Purchase models since they also negotiated directly with the manufacturers. D.C., Pennsylvania and Kentucky fall into this category.²

Cost data

The National ADAP Monitoring Project reports annually on the number of clients served by ADAP by state and also on ADAP expenditures and number of prescriptions filled for ADAP clients by class of drug (Davis et al., 2003). NASTAD data were used to calculate the average ADAP expense per monthly prescription for each of five drug classes for each state during the report month of June in each year considered.

Our analysis concentrates on the three classes of HIV medications that accounted for 86% of the costs in the average ADAP in 2002 Davis et al. (2003). These drug classes, are nucleotide reverse transcriptase inhibitors (NRTI), non-nucleotide reverse transcriptase inhibitors (nNRTI) and protease inhibitors (PI). A minimum of three drugs, including at least one protease inhibitor, is required for effective HIV treatment (called HAART or highly active antiretroviral therapy).

We had access to the data the California Office of AIDS reported to HRSA (California State Office of AIDS, 2004), and thus were able to verify that the cost per prescription calculated by our method differed by at most 3% from the average cost reported by the state to HRSA.

We applied a “distribution markup” to each state’s average expenditure for each of the three drug types to account for the fact that the drug spending figure in rebate states includes the retail pharmacy’s cost of distributing the drugs. Drug distribution costs in direct purchase states are paid out of ADAP funding, but are not included as a drug expenditure in NASTAD or federal government reports. The markup factor also adjusts for the fact that rebate states can use the rebates and discounts that they receive to cover ADAP operating expenses and reduce needs for supplemental state funding for the program. This markup factor is calculated by dividing each state’s total state and federal ADAP allocation (less expenditure for insurance purchase for PLH) by that state’s total reported cost of ADAP drug purchases. We then multiply the calculated per prescription cost within each drug category by the markup factor to obtain an estimate of the “fully loaded” cost of providing a prescription for each class of AIDS drugs in each state. Although discounts and rebates may be higher for some classes of ARVs, data limitations required us to apply the same loading factor to each drug class within a given state. This method of calculating per prescription costs allows for the fact that administrative costs and rebates systematically differ across the different forms of organization of ADAP programs. The markup factor adjustment was also necessary because

² Direct purchase states managed by state or PBM: Arizona, Delaware, Florida, Georgia, Iowa, Louisiana, Mississippi, New Mexico, Nebraska, Nevada, Pennsylvania, Puerto Rico, South Carolina, Texas, Virgin Islands, Virginia, Washington DC Direct purchase states using Prime Vendor: Alabama, Arkansas, Colorado, Hawaii, Illinois, Kentucky, Montana, Ohio, Tennessee Rebate states with fewer than 100 pharmacy contracts: Alaska, Idaho, Maine, Missouri, Washington Rebate states with 100–1000 pharmacy contracts: Indiana, Michigan, West Virginia Rebate states with more than 1000 pharmacy contracts: California, Connecticut, Kansas, Maryland, Minnesota, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Oklahoma, Oregon, Rhode Island, South Dakota, Utah, Vermont, Wisconsin Guam, Massachusetts and Wyoming had an unknown number of pharmacy contracts.

states do not independently report their administrative costs and both discounts and rebates are confidential data about which we could not obtain direct information.

Multivariate analysis

We pooled data for the years 2000–2003 and conducted regressions that related fully loaded spending for a given state or territory for each class of ARVs (NRTI, nNRTI, PI) to the type of ARV and the ADAP model used by the state in the year. Other specifications included measures of the size of the ADAP program and the numbers of pharmacies the state had contracted with for dispensing.³ All regressions were weighted by the number of prescriptions provided by the state ADAP in the corresponding year and standard errors are adjusted to allow for non-independence of the observations across drug types within a state.

To test the hypotheses relating to model type, we include indicator variables that reflect whether the state organized its ADAP program as a rebate program (the excluded category), a direct purchase system that used the Prime Vendor, or a direct purchase system that used a PBM or the state as the agent. We also include indicators for year of observation (2001, 2002, with 2003 the excluded category) and the type of drug, NRTI or PI (nNRTI is the excluded comparison). Ideally, we would have liked to exploit the change in ADAP models within a given state to identify the causal effect of model type in a difference-in-differences framework. However, few states changed model types during the period of observation, so this was not a feasible strategy.

The first specification estimated contains no state controls other than ADAP model type. One might argue that a state's choice of model type might be related to the characteristics of the state. The state characteristic most likely to be related to both model choice and costs per prescription is the volume of ARV prescriptions the state expects to purchase. If this is the case then the coefficient on model type is subject to omitted variable bias. To test this possibility, we add a measure of prescription volume to the basic model to determine if the findings on organization type are robust to the inclusion of a possible predictor of ADAP model. Other state characteristics, such as per capita income, are unlikely to affect ADAP model type, which is not a choice made by individuals. In addition, as explained in the preceding section, the market for pharmaceuticals is a national market and costs per prescription are unlikely to vary by region or location of the state.

We next examine whether, among direct purchase states, those with larger purchases use their market power to lower average costs. Drug purchase volume is measured by the number of prescriptions provided by the ADAP program in the previous year. For Prime Vendor states, we use the total number of prescriptions the Prime Vendor purchased for all states. To distinguish whether states with a larger number of prescriptions have lower prices due to their market power or due to economies of scale, we rerun this regression using a sample of rebate states. If the lower prices relate to economies of scale rather than market power, the relationship between size of market and drug prices should be negative and equally strong for rebate and for direct purchase states.

To test whether rebate states can extract additional discounts from retail pharmacies, we examine how average prescription costs relate to the number of pharmacies contracted with by the state. Most rebate states contract with more than 1000 pharmacies, four had fewer than 100 pharmacy contracts and an additional four states have contracts with between 100 and 1000 pharmacies. For this reason, we defined a state as contracting with a large number

³ Tennessee, Indiana and Delaware use large shares of their ADAP funding to purchase insurance. Thus their data were not used to calculate average drug prices. Data for Washington State in 2001 was also dropped for this reason.

Table 1 Monthly costs per prescription and number of prescriptions dispensed by drug type and purchasing organization type

	Direct purchase states	Rebate states
<i>nNRTIs</i>		
Average monthly cost per prescription	\$284.30	\$279.63
Number of Rx dispensed per state per month	466	680
<i>NRTIs</i>		
Average monthly cost per prescription	\$311.30	\$303.71
Number of Rx dispensed per state per month	1,690	2,331
<i>Protease inhibitors</i>		
Average monthly cost per prescription	\$431.17	\$392.84
Number of Rx dispensed per state per month	746	992

Notes:

1. The data based on the NASTAD survey of all ADAP programs for the years 2000 to 2003. Costs per prescription are multiplied by a “loading factor” to account for administrative and distribution costs and the fact that some states apply the rebates and discounts that they receive from manufacturers to purchase additional drugs. This loading factor is calculated by dividing each state’s total state and federal ADAP expenditure (less expenditure for insurance purchase for PLH) by that state’s total reported ADAP spending on pharmaceutical purchases. We then multiply the calculated per prescription cost within each drug category by the distribution markup factor to obtain an estimate of the “fully loaded” cost of providing a prescription for each class of drug in each state

2. Data for TN, IN and DE were dropped due to inconsistencies in their data reporting, as was data for 2001 for WA

of pharmacies if there were more than 100 pharmacies in its network. Chains of pharmacies count as one contract. We did not have data on numbers of pharmacies for Guam, Massachusetts or Wyoming, so these observations were dropped from this regression.

Results

Table 1 presents the descriptive data on costs per prescription and number of prescriptions for rebate and direct purchase states. The data show that average costs per prescription are higher in direct purchase compared to rebate states across all three drug types. However, the data also show that rebate states tend to buy larger numbers of antiretroviral drugs and therefore might enjoy lower costs due to greater bargaining power or economies of scale. Therefore, the descriptive data alone cannot isolate the effects of purchasing mechanism and size of drug purchases on costs per prescription.

Table 2 reports the results from the seven different multivariate models that test hypotheses 1 – 4 and attempt to isolate the independent effects of purchasing mechanism, size of drug purchases and size of pharmacy network on costs per prescription. The basic model reported in Column 1 shows that states that negotiate directly with manufacturers for their ADAP drugs obtain average costs per prescription that do not differ significantly from those in rebate states. The results in Column 2 indicate that this result is robust to the inclusion of data on market size, which may be correlated with choice of ADAP model. Across all states, there is a negative relationship between per prescription costs and having larger numbers of drug purchases in the previous year, but this effect is only statistically significant at the 10% level. Both specifications indicate, contrary to Hypothesis 1, that rebate states achieve prices that are as low as direct purchase states, once administrative costs and rebates have been accounted for. The coefficients on drug type show that newer HIV drugs cost more than older drugs. In particular, column 1 shows that nNRTI and Protease Inhibitors on average

Table 2 Results from empirical models of per prescription costs as a function of purchasing mechanism, market power and size of pharmacy network

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All states 2000–2003	All states 2001–2003	DP states 2001–2003	Rebate states 2001–2003	Rebate states 2001–2003	Rebate states 2001–2003	Rebate states 2000–2003
NRTI	24.98 [6.75]***	40.96 [11.75]***	42.89 [12.92]***	47.55 [18.06]**	47.06 [19.85]**	25.47 [11.45]**	21.85 [8.62]**
Protease inhibitors	127.22 [8.57]***	136.50 [12.18]***	166.09 [21.35]***	118.90 [8.28]***	115.68 [8.43]***	110.76 [6.54]***	110.94 [4.96]***
Direct purchase: State or PBM as agent	24.39 [33.31]	-9.54 [18.98]					
Direct Purchase: Prime Vendor	-20.55 [21.90]	-16.53 [24.24]	5.18 [26.01]				
Size (# of units last year)		-0.002 [0.001]*	-0.005 [0.002]**	-0.002 [0.001]*	-0.002 [0.001]		
Year = 2000	-14.82 [29.86]						4.04 [26.990]
Year = 2001	-18.48 [29.00]	4.17 [18.15]	23.36 [16.03]	-10.70 [24.00]	-12.41 [24.62]	-11.59 [25.00]	-11.75 [24.90]
Year = 2002	7.46 [27.48]	34.48 [15.20]**	52.96 [19.62]**	19.71 [20.08]	24.29 [20.99]	22.40 [20.32]	22.39 [20.27]
# of Pharmacies > 100					56.81 [20.89]**	35.29 [12.94]**	40.39 [14.25]***
Constant	281.78 [20.57]***	270.97 [14.03]***	250.09 [15.30]***	280.72 [14.28]***	226.63 [15.20]***	239.37 [11.44]***	236.66 [15.44]***
Observations	544	386	192	194	176	185	247
R ²	0.15	0.32	0.43	0.27	0.30	0.28	0.30

Notes:

- * significant at 10%; ** significant at 5%; *** significant at 1%
- Robust standard errors in brackets
- Federal budget data adjusted for insurance payments, from HRSA and NASTAD
- Data for TN, IN and DE were dropped due to inconsistencies in their data reporting, as was data for 2001 for WA
- Year 2000 data not available for regressions that include size of market in prior year

cost \$25 and \$127 more respectively than the older NRTI drugs. Similarly the time trend variables in column 1 show that compared to 2003, per prescription costs were somewhat but not significantly lower in prior years.

Column 3 shows that the negative relationship between average drug cost and market size is statistically significant in direct purchase states, which confirms Hypothesis 2, that states purchasing a larger quantity of drugs may use their market power to negotiate lower prices from manufacturers. Considering rebate states alone (column 4), the effect is less strong, and significant only at the 10% level. The lower average costs in higher volume rebate states may be attributable to economies of scale (Hypothesis 3), since rebate states all face the same drug prices and level of rebates.

Columns 5, 6 and 7 examine Hypothesis 4, which proposes that rebate states that contract with a large number of pharmacies (> 100) to dispense drugs have higher costs per prescription than rebate states that use fewer pharmacies. The results in Column 5 show that rebate states using more than 100 pharmacy contracts to distribute ADAP drugs, experience per prescription costs averaging \$57 more than in states with smaller pharmacy networks. The significance of this finding is robust to the inclusion or exclusion of the size variable (Column 6) and the time period covered (Column 7).

Conclusions

Our empirical analysis suggests that there are no significant differences in per prescription ARV costs among states that organize their ADAP programs as rebate model or direct purchase, with or without using the Prime Vendor. In drawing this conclusion, it is important to account for the rebates and discounts so widely available in purchasing pharmaceuticals. Without appropriately incorporating the rebates, which ADAPs can use to fund their programs, apparent cost per prescription would be higher in states using the 340b rebate method. After accounting for rebates and discounts, it appears that manufacturers are willing to sell drugs at similar prices to ADAP programs that use different purchasing models.

The enhanced rebates that California, New York and other large ADAPS negotiated in 2003 will apply to all states, not just those who met with the manufacturers. Thus, we do not see any forces that would alter the finding of similar per prescription costs across ADAP model types in the near term. These results indicate that states are unlikely to achieve lower costs for ADAP drugs by changing the purchasing mechanism their ADAP programs use. States may prefer to organize their ADAP programs using the rebate model because it is easier to make the case with state legislators that this is an efficient program when the accounts show low administrative costs (funded by rebates) and high nominal expenditures on pharmaceuticals.

The finding that the average price paid by a direct purchase state for ARVs is negatively related to the numbers of prescriptions purchased monthly supports the hypothesis that states can use their market power to obtain ARVs at lower cost. Thus, it might be beneficial for additional direct purchase states with small numbers of monthly drug purchases to join the Prime Vendor program, where they can benefit from the greater negotiating power of a large purchasing pool. Although all rebate states obtain the identical rebate, which the federal government negotiates with the manufacturers, they do not all pay the same average costs for ARVs. States with larger volume succeeded in achieving lower average costs, suggesting that part of the volume effect relates to economies of scale. This may relate to their ability to spread fixed costs of running an ADAP program over a larger number of prescriptions. Alternatively, their greater volume of drug purchases may give them an ability to negotiate more favorable terms with PBMs to administer the program.

Our results suggest that rebate model states can also use their market power. Those states that contracted with a smaller number of pharmacies or pharmacy networks were able to obtain lower per prescription costs for ARVs. This provides evidence that states are able to negotiate discounts with retail pharmacy networks in return for the pharmacies' expectation of greater volume of purchases. In this regard, states are following the pattern of PBMs in the commercial market, where discounts from preferred pharmacies are common. States that are willing to negotiate with a smaller number of pharmacies or pharmacy chains can take advantage of this second source of discounts to lower the costs of their ADAP programs.

Our examination of state contracts with PBMs in rebate states shows that many states pay for drugs sold by retail pharmacies at a fixed discount below the AWP. Because they delegate the actual price negotiation with the retail pharmacies to their agent, the PBM, these states do not capture the benefit from retail pharmacies' willingness to discount prices. To lower their costs, rebate states could negotiate contracts with their PBMs to provide for some of the retail pharmacy rebates to return to the ADAP program, while at the same time creating incentives for the PBM to negotiate favorable prices. Reducing the number of retail pharmacies that distribute ADAP drugs may impose burdens on some ADAP clients, particularly those living in rural areas, who may have to travel greater distances to an ADAP outlet. However, this strategy for controlling net ADAP expenditures may be preferable to limiting access to ADAP by reducing eligibility or creating waiting lists or restricting formularies due to inadequate program funding.

The tight fiscal situation confronted by many states combined with the steadily increasing demand to meet the needs of underinsured PLH in the US, put additional pressure on state ADAP programs to seek ways to lower the net prices that they pay for drugs. Our analysis suggests that changing the way that state ADAP programs are organized is unlikely to result in substantial cost savings. Manufacturers use different means to give similar price reductions to ADAP programs organized as direct purchase or as rebate models. However, adopting the negotiation strategies used by commercial insurers and their PBMs will allow state ADAP programs to use their market power to benefit from discounts from retail pharmacies in exchange for market share. Federal level purchasing for all ADAP drugs might result in the lowest average prices, given our findings on market power. However, given the equivalence of the prices currently achieved in the two systems, rebate states may be unwilling to give up the source of flexible funding that the rebates provide them.

Our results also have implications for understanding the possible effects of The Medicare Prescription Drug Price Negotiation Act of 2007 (H.R. 4). This bill would require the Secretary for Health and Human Services to negotiate directly with manufacturers to lower covered part D drug prices on behalf of Medicare beneficiaries starting in 2008, reversing the Medicare Modernization Act's (MMA) prohibition against allowing the federal government to negotiate drug prices. Our results suggest that private PBMs, who are allowed under the MMA to negotiate drug prices on behalf of Medicare beneficiaries, are at least as good at achieving lower prices as government officials. At first glance, it would seem that H.R. 4 would do little to control Medicare Part D prices. On the other hand, our results also suggest that agents with greater market power are able to extract significantly lower prices. Since H.R. 4 allows Medicare to consolidate its market power and negotiate as a single entity, it is possible that H.R.4 might result in significantly lower prices for Medicare Part D drugs.

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References

- Berndt, E. R. (2002). Pharmaceuticals in U.S. health care: Determinants of quantity and price. *The Journal of Economic Perspectives*, 16, 45–66.
- Berwick, D. (2002). We all have AIDS: Case for reducing the cost of HIV drugs to zero. *British Medical Journal*, 324, 214–218.
- California State Office of AIDS. (2004). unpublished report on state expenditures by drug class.
- Centers for Disease Control and Prevention (CDC). (2005). *HIV/AIDS Surveillance Report 2005* (Vol. 17). Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Accessed March 8, 2007 at: <http://www.cdc.gov/hiv/topics/surveillance/resources/reports/2005report/default.htm>.
- Clinton Foundation. (2006). Agreements with Nine Companies Will Lower Prices of HIV Diagnosis and Two HIV/AIDS Medicines by 30–50 Percent for 50 Countries. Clinton Foundation Press Release dated January 12, 2006. New York, NY: Clinton Foundation. Available at www.clintonfoundation.org/011206-nr-cf-hs-ai-isr-ind-chn-zaf. Accessed 24 March 2006.
- Davis, M. D., Aldridge, C., Kates, J., & Chou, L. (2003). *National ADAP Monitoring Project. Annual Report*. Washington, D.C.: The Kaiser Family Foundation and National Alliance of State and Territorial AIDS Directors.
- DHHS. Office of Inspector General. (2001). *Cost Containment of Medicaid HIV/AIDS Drug Expenditures*. Washington, D.C.: DHHS Office of Evaluation and Inspections. OEI-05–99–00611.
- Frank, R. G. (2001). Prescription drug prices: Why do some pay more than others do? *Health Affairs*, 20, 115–28.
- Grinberg, L. (1998). Soaring prices, soaring sales. *GMHC Treatment Issues*, 12(12), 5–7.
- Kates, J., Penner, M., Crutsinger-Perry, B., Leggoe, AW, Singleton, N. (2005). *National ADAP Monitoring Project. Annual Report 2005*. Washington, D.C.: The Kaiser Family Foundation and National Alliance of State and Territorial AIDS Directors.
- Kates, J., Penner, M., Crutsinger-Perry, B., Carbaugh, A. L., Singleton, N. (2006). *National ADAP Monitoring Project. Annual Report 2006*. Washington, D.C.: The Kaiser Family Foundation and National Alliance of State and Territorial AIDS Directors. Available at: www.kff.org/hiv/aids/upload/7464.pdf. Accessed March 30, 2006.
- Richardson, K. (n.d.). The Public Health Service (PHS) Section 340B Drug Pricing Program In Basic Language. (Draft). Accessed 3/8/07 at http://pssc.aphanet.org/pdfs/340b_handbook.pdf
- Scherer, F. M. (2000). The Pharmaceutical Industry. In A. J. Culyer & J. P. Newhouse (Eds.), *Handbook of health economics* (Vol. 1, pp. 1297–1336). Amsterdam: Elsevier Science.
- U.S. Government Accountability Office. (1998). *HIV/AIDS Drugs: Funding Implications of New Combination Therapies for Federal and State Programs*. Washington, D.C.: GAO/HEHS-99-2.