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Pricing and competition in essential medicines markets: the supply chain to Tanzania and the role of NGOs

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Abstract

It is now widely argued that many of the problems of pricing and accessibility of essential medicines in Africa lie in market structure and regulation failures within African countries. This paper presents new findings on pricing, margins and competition along the supply chain from manufacturers of essential medicines, in India, Kenya and Tanzania, to medicines buyers in Tanzanian rural areas. Based on these findings the paper considers the extent to which current faith-based and secular NGO non-profit actors are playing a beneficial role in promoting access to reliable medicines, and discusses whether and how that role might be strengthened. While it is often argued that NGOs can be reliable and trustworthy actors in problematic low income private health care markets, the role of NGOs in low income countries' medicines supply is less studied, and policy proposals on NGOs' roles are rarely rooted in an understanding of their market contexts.

Introduction: essential medicines markets in Tanzania

> *'The drugs that are needed for the major health problems of the majority of the population … effective, safe, cost-effective … being an essential drug implies that it should be available within functioning health systems to anyone that needs it in the right dosage, the right presentation and at the price that the individual or the community can afford.'* [WHO essential medicines expert]

Essential medicines policies are an important tool whereby low income countries can identify cost-effective use of limited public funds for medicines purchase and attempt to encourage the rational use of drugs. Tanzania is one of 156 WHO member countries that have a national essential medicines list, based on WHO lists and adapted to local conditions[i]. The markets supplying these essential medicines to rural African consumers are currently the subject of considerable policy debate and intervention. Many international commentators and policy actors argue that the problems of pricing and accessibility of essential medicines lie in good part at the door of market regulation failures and market inefficiencies *within* African countries[ii]. Current interventions include tightening regulation, locally and internationally, as Tanzania is seeking to do, and greatly increasing international funding for some medicines. Some African countries including Tanzania have also actively been building up their local manufacturing capacity in essential medicines. However, empirical research on the competitive processes and outcomes at various levels of the essential medicines markets and supply chains reaching to African rural areas remains thin.

This paper aims to contribute to 'thickening' that literature, with a particular focus on the role of non-governmental faith-based and other actors' roles in the supply chain. It draws on a set of survey data, interviewing, and other data collection that traced aspects of the supply chain for essential medicines from India to Tanzania. Tanzania was chosen as the research location because it faces a serious problems of medicines access, generated by a fee-based medicines distribution process in a liberalised health system relied upon by a population with very low income levels, while having an active government policy seeking to improve medicines regulation and access, and also an active non-governmental religious and secular NGO sector. Tanzania thus offers a good research context for exploring market competition and pricing and their implications for access; for comparing non-governmental non-profit with private sector activity in these markets; and for drawing out some policy proposals.

Tanzania has a medicines market which combines centralised public procurement for the public and non-profit sectors, through a government semi-autonomous buying

agency, with a private medicines market which until recently was subject to little regulatory control (Mujinja et al 2003). Medicines market liberalisation and informalisation in low income Africa was an element of broader health service liberalisation in the late 1980s and early 1990s, running against the grain of the WHO-led essential medicines initiatives from the late 1970s and 1980s (Turshen 1999; WHO 2004). Economic crisis and the liberalisation of clinical medical practice was associated with the introduction of user fees in the public sector for consultations and medicines, with the establishment of revolving drugs funds in health facilities across Sub-Saharan Africa, and the spread of self-medication and informal medicine-selling in unlicensed private shops (Turshen 1999, Everard 2003). Data from the Demographic and Health Surveys for Tanzania, undertaken in 1996 and 2004, show the expansion of reliance on self-medication through purchases in pharmacies and drug shops, for children with two common ailments[iii].

Table 1: Children with cough/ fever and with diarrhoea: percentage of all visits to facilities by ownership and to pharmacies

Type of facility	**Children with cough/ fever**		**Children with diarrhoea**	
	1996	**2004**	**1996**	**2004**
Public facilities	79.25	63.79	81.79	67.12
Religious/ NGO facilities	4.18	5.86	6.19	5.56
Private facilities	3.89	7.77	3.09	7.59
Private pharmacies	12.68	22.57	8.93	19.73
Total	100.00	100.00	100.00	100.00

Source: calculated from Demographic and Health Survey data for Tanzania[iv], 1996 and 2006

The importance of the non-governmental religious-owned sector in Tanzania is understated by the DHS data in Table 1, in part because the religious hospitals supported by the government to act as district hospitals are included in the public sector category. The religious-owned sector in Tanzania, as elsewhere in Africa, has long relied on sale of medicines for part of their income. Income from medicines sales became a key element of public sector health finance in urban dispensaries and public hospitals (often representing the main element of discretionary income retained at local level) and also a key part of private health business income, in Tanzania and across the sub-continent (Mujinja et al 2003; Mackintosh and Tibandebage 2007; Konaté and Kanté 2005).

In Tanzania therefore, most medicines are purchased out of pocket by consumers; only some medicines in rural public dispensaries, and certain medicines forming part of externally supported vertical programmes such as those for tuberculosis and HIV/AIDS, are widely not universally) made available free of charge or at low informal fees (Mackintosh and Tibandebage 2005). There are shortages of both free medicines and those charged for, especially but not only in public facilities (URT/WHO n.d.; URT 2006). This experience is widespread across Africa and many other low income developing countries, and out of pocket payment is an important cause of impoverishment in Africa as in Asia (van Doorslaer et al 2006; WHO 2004).

There is growing availability of comparable medicines price data across countries generated by a very effective WHO/HAI collaboration (WHO/HAI 2003), results of which for Tanzania are compared with our results below. Analytical work on the market structure and competition patterns in essential medicines market in Africa has however lagged behind. This paper explores, for the supply chain to the rural areas covered in this survey, the following policy-relevant research questions. They focus on the pattern of competition within Tanzania, on its links to overseas medicines markets, and on the role of NGOs.

First, it is quite widely suggested (for example, IFC 2007: 89) that lack of competition among medicines outlets leads to high margins in African retail medicine sales. An alternative hypothesis would start from very low purchasing power of medicines buyers and long distances from towns and wholesalers in many rural areas, and link margins charged to the search for profitability by small shopkeepers and to the need to sustain private and religious/ NGO medical provision through medicines sale. To explore these issues, we report rural retail and facility prices in the religious/NGO and private sectors; calculate wholesale and retail margins along the supply chain for a set of essential medicines; and explore influences on pricing. If income influences prices, margins and sales strategies, we would expect experiences of medicines buyers to differ in the poorest districts from those in the better off districts.

Second, the literature suggests (Gilson 2003; Leonard 2000) that faith-based and other NGO-owned facilities are more trustworthy than the commercial sector. How does this hypotheses perform in the essential medicines market in rural areas? Do faith-based and other NGOs sell at lower prices and on a more professionally appropriate basis, than private facilities? Do health facilities in general (dispensaries, health centres and

hospitals) sell at lower prices and on a more professional basis than the private drug shops?

Third, we present evidence that India and Kenya are important suppliers of low cost essential medicines to Tanzania, and that Tanzania is also successfully re-establishing and developing its local pharmaceutical manufacturing and distribution. There is little evidence available about the relative reputation and pricing performance of medicines from the three sources. If imported medicines are preferred by consumers we would expect to see a price premium for Indian and Kenyan over Tanzanian goods. If prices are similar at retail level where medicines from the three main sources are available, this suggests a competitive market between local manufacturers and imports. We explore the extent to which prices of particular medicines vary according to country of origin.

Fourth, there are some medicines, including paediatric suspensions and injectables, are more expensive than the most commonly purchased medicines, and have fewer suppliers within Tanzania. If these medicines have higher margins than others, this suggests that competition influences level of margins. Conversely, if these medicines command lower margins, this suggests a strong influence on margins of income constraints and problems of business viability. We explore these issues.

Finally, it has been suggested (WHO/EPN 2006) that government and non-governmental non-profit wholesalers generally buy and sell efficiently, at lower prices than private wholesalers. There is also evidence (Maïga et al 2003) that prices of medicines in different sectors interact at retail level. We explore these issues by comparing prices and margins of non-profit, governmental and commercial wholesalers, and by comparing Tanzanian medicines prices with international prices at wholesale level (private and non-profit) from European-based ‘social’ wholesalers and at retail level in India.

The paper therefore presents evidence on the patterns of competition and price setting along the supply chain, including price comparisons with international wholesalers specialising in essential medicines. At each stage, a particular focus is on understanding the role played by non-governmental non-profit organisations, including faith based and other NGO medicines outlets, and ‘social’ wholesalers at domestic and international levels. Some policy implications are discussed at the end of the paper.

Methodology

The rural survey was undertaken in late 2006 in four districts: Manyoni and Singida Rural districts in Singida region; Moshi Rural and Rombo districts in Kilimanjaro region. The regions of Singida and Kilimanjaro were chosen, first, to reflect economic variability among Tanzania's regions. Singida has the highest percentage of households below the basic needs poverty line of any region in Tanzania, while Kilimanjaro has the fifth lowest percentage after the four main urban centres. Of the districts, Singida Rural has the fifth highest percentage of such households in the country (56%), and Manyoni 49%, while in Kilimanjaro the figures are 37% for Rombo and 28% for Moshi Rural. The infrastructure is also very different in the two areas: over three quarters of the population in the two rural Kilimanjaro districts have access to protected water sources; in the Singida rural districts it is 38% and 34% respectively. In Singida Rural only 31% of households own a radio, one of the lowest proportions in the country; in Manyoni it is 44% and in the Kilimanjaro districts over two thirds (URT 2005 Table 14 and Appendix Table A9).

The districts were also chosen to provide a sufficient number of FBO/NGO medicine outlets to fulfil the study objective of assessing the impact of these on medicines access. Table 2 shows the breakdown of facilities and shops studied, by district, level of facility and ownership. There are few health centres in these districts, so they have been included with dispensaries in each ownership category. Faith-based and secular NGO facilities have been aggregated; most of the non-governmental not for profit facilities were faith-based. Table 2 also shows the number of medicines buyers interviewed on exit from shops and facilities, by district and facility category.

Table 2: Facilities studied by district, level and ownership: number of facilities (number of exit interviewees in brackets)

Region and District	**Singida**		**Kilimanjaro**		**Total**
Type of outlet	**Manyoni**	**Singida Rural**	**Rombo**	**Moshi Rural**	
Private drug shop	7 (36)	8 (37)	8 (40)	8 (40)	**31 (153)**
Private health centres / dispensaries	2 (10)	0 (0)	1 (5)	3 (17)	**6 (32)**
FBO / NGO health centres / dispensaries	5 (42)	6 (9)	7 (35)	5 (26)	**23 (112)**
FBO hospitals	2 (10)	3 (22)	2 (12)	2 (11)	**9 (55)**
Total	**16 (98)**	**17 (68)**	**18 (92)**	**18 (94)**	**69 (352)**

As Table 2 shows Singida Rural, the most deprived district, where distances are very long to facilities, had fewer facilities in total and supported no private prescribing facilities. Furthermore, fewer users per health centre or dispensary were encountered for interview on exit, so our exit interviews in Singida Rural are significantly biased towards drug shops and hospitals, a bias allowed for in the analysis below.

Data collection instruments were prepared in English. Except for those used for interviewing manufacturers, wholesalers, importers and distributors, they were all translated into Kiswahili, then back into English as a check, then into Kiswahili again before they were piloted. Pre-testing of the research instruments was done in medicine outlets in and outside Dar es Salam region, by research assistants who were all graduates of first degrees in medicine or environmental studies, who were all trained and recruited from Dar es Salaam. The questionnaires were then revised before use in the study.

For the rural study, five questionnaires were administered in each medicine outlet: for owners, prescribers, dispensers, and medical sellers if different from dispenser, plus the questionnaire for exit interviews. In addition, all the selected medicine outlets' authorities were asked to fill in information for a selected list of 31 essential medicines, a list which was used as tracer medicines for the whole broader study. These 31 medicines were selected from the National Essential Drug List, as medicines that are used frequently in primary and secondary care facilities[v]. We adopted the WHO research guideline for research into essential medicines pricing (WHO/ HAI 2003). For each medicine, information was collected regarding type of medicine, generic or branded, type in stock, the unit of dispensing, the unit buying price, and the unit selling price, plus in addition, details of manufacturer and country of origin.

In the questionnaires for owners or managers or their representatives, prescribers, medicine sellers, dispensers, and customers, extensive information on the medicine prescribing, dispensing, customer's rights, affordability, accessibility, regulations, and prices and sources of medicines were solicited. A total 69 managers or owners, 32 prescribers, 31 dispensers, and 27 medical shop sellers (not owners) were interviewed.

In addition, semi-structured interviews were undertaken with nine wholesalers, including the government medicine buying agency, two non-governmental non-profit wholesalers and six private wholesalers. In many cases, this included more than one interview, and where possible buying and selling price data were also collected for the tracer

medicines. Semi-structured interviewing also included officials and pharmacists in the two main Christian umbrella organisations, and discussion with a number of policy makers including the chief pharmacist, officials of the Tanzania Food and Drug Authority (TFDA), an expert supporting the regulatory initiative for rural drug shops known as the Accredited Drug Dispensing Outlets (ADDO) project. Finally, managers of three of the Tanzanian medicines manufacturing enterprises also agreed to interviews and site visits to their plants.

Medicines markets in four rural districts

We begin from the recorded experience of those buying medicines in the rural districts. As noted above, Singida and Kilimanjaro Regions differ sharply in income levels and level of development of infrastructure and economic activity. As expected, the medicines buyers interviewed in rural Tanzania had predominantly low education, though interviewees in the districts of the better off region (Kilimanjaro) were significantly[vi] more likely to have secondary education or above (Table 3). About 70% of interviewees of both sexes were between 20 and 40 years of age. Rather more women than men were interviewed in most districts (Table 3), in part no doubt because women were more likely than men to be purchasing drugs for others. Of the women interviewed, 37% overall (and 34% in drug shops) were buying medicines for children. Of all exit interviewees, those in the poorer region, Singida, were significantly[vii] more likely than others to be purchasing for children: this is consistent with children being given priority when incomes are very low.

Table 3: characteristics of exit interviewees by district

Characteristic	Manyoni	Singida Rural	Rombo	Moshi Rural	Total
Sex (% female)	56.12	54.41	48.91	70.21	**57.67**
Median age (years)	29	29	34.5	32	**30**
Primary education only (%)	71.30	77.94	65.22	71.28	**71.02**
Secondary or college education (%)	14.28	14.51	27.18	22.34	**19.88**
Buying for children (%)	37.76	32.35	17.39	28.72	**28.98**

Just over one third of those interviewed at drug shops said they had brought a prescription, and there were no significant differences between districts (Table 4). As the poorest district, with the fewest available medicines outlets, we might expect Singida Rural to display some distinct market characteristics, and indeed exit interviewees in Singida Rural were significantly[viii] more likely than those elsewhere to have found the drugs they were seeking to be unavailable (Table 4).

Virtually everyone had paid 'out of pocket' for their medicines, supported by themselves or money from relatives; only 5% of interviewees had had medicines paid for by a savings or insurance fund or an organisation such as an employer, and there were no significant differences between districts in this proportion (Table 4). Overall, 8% said they were unable to afford all the drugs available, and this percentage will underestimate affordability problems, since those who were sure they could not afford medicines will generally not have come to the outlets at all. Worryingly, 15% of those who had been able to purchase medicines said they had received only a part-dose, a medically dangerous practice in terms of encouraging drug-resistant infection, and again the districts did not differ significantly (Table 4).

Table 4: experience of exit interviewees by district

Characteristic	Manyoni	Singida Rural	Rombo	Moshi Rural	Total
Had a prescription (%)*	38.84	43.24	32.50	27.50	**35.29**
Found some or all drugs unavailable (%)**	11.36	21.74	10.00	3.61	**10.44**
Unable to afford some or all of available drugs (%)	12.5	4.92	5.62	6.45	**7.67**
Funds provided by organisation or Fund (%)	5.15	3.17	7.87	3.19	**4.96**
Received part not full dose (%)	16.84	14.75	11.49	18.28	**15.48**
Mean payment*** (Tshs)	1161.08	924.17	1423.31	1238.93	**1212.89**
Median payment*** (Tshs)	950	585	975	800	**800**
Median payment* (Tshs)	500	500	600	600	**500**

* Drug shops only
** Interviewees at non-hospital prescribing facilities and shops only
*** All facilities and shops.

Singida Rural exit interviewees had paid significantly[ix] less than others in total for their medicines when all outlets are included. At drug shops alone, the differences in payments between districts were not significant. The mean total payments are substantial at these income levels. The highest payments observed, furthermore, were almost all in the two districts in the better off region of Kilimanjaro (Figure 1).

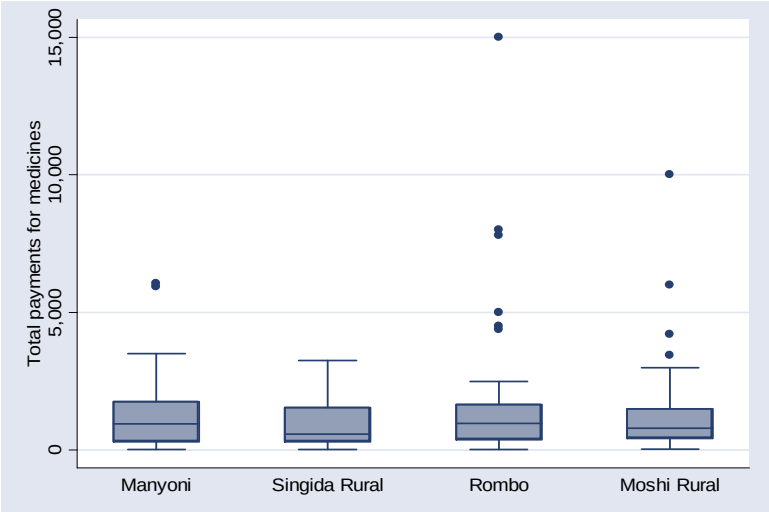
It is likely that the observed total payments for medicines are strongly income-constrained, as the interviews with facilities confirmed:

> *We get a lot of [bad] debts for admission and treatment because we exempt from drug charges patients who cannot afford to pay.* [FBO hospital doctor, Singida]
>
> *Most of our clients have very low incomes so we avoid prescribing drugs that are not available in this hospital: if we do that, then it's hard for us to follow up to find*

out whether the person gets the medicine or not. [FBO hospital doctor, Kilimanjaro]

This is also the finding reported in the most recent Tanzanian *Medicine Price Monitor* (URT 2007), which concluded that private and mission sector medicine prices were unaffordable for 'most Tanzanians especially those on low incomes' (p.3), and noted that the first line anti-malarial treatment cost in the mission sector in 2007 the equivalent of two days wages for a low paid public servant.

Figure 1 Box plot: total payments for medicines by exit interviewees, all types of facility, by district. (Tshs)



Finally, we might expect that poorer districts would tend, as a result of low buying power, to have lower observed prices than better off districts. An alternative hypothesis is that a relative lack of competition and higher costs may produce higher prices. The number of observations of purchases of individual medicines are too few to analyse by district. We can however compare mean and median stated prices by district for sets of medicines available in all districts, drawn from the tracer medicines data.

Table 5 displays several sets of such price data by district. The first two sets of medicines are used for analysis throughout this paper: they are, first, the set of 18 tracer medicines[x] that were available in at least two of each category of facility (drug shops and private and FBO/NGO health centres and dispensaries, and FBO hospitals) across the study; and second, the set of 27 medicines[xi] found to be available in at least two of each category of prescribing facilities only (health centres, dispensaries and hospitals) across the study.

As Table 5 shows, Singida Rural has the lowest robust mean[xii] stated prices across the districts for these two sets of medicines. However, one cannot draw the conclusion that Singida Rural prices are on the whole lower; that conclusion would not itself be robust. Median prices for these sets of medicines are lower in the better-off district of Rombo (Table 5). Sign tests comparing Singida Rural prices with the Kilimanjaro districts show an uneven pattern of higher and lower prices by medicine, and no clear conclusion. Prices for these sets of medicines in Singida Rural only appear consistently lower than in Manyoni district in the same region.

The results appear to be influenced by two factors: quite wide variability in prices by medicine within districts, and the absence of private dispensaries (the highest charging facilities) from Singida Rural. The third and fourth data sets in Table 5 allow us to test the latter hypothesis. For a set of 11 tracer medicines[xiii] found in at least one drug shop in each district, Singida Rural and Manyoni – the districts in the poorer of the two regions – have significantly[xiv] higher prices than drug shops in the districts in Kilimanjaro region. However, prices of 27 medicines available in FBO or NGO facilities[xv] (health centres, dispensaries and hospitals) (Table 5) do not differ significantly across the districts. In summary, residents in the districts in the poorer region tend to face higher drug shop prices but similar FBO/NGO prices to those in the better of region, but there is considerable variability within each category. In Singida Rural, private prescribing facilities are unavailable.

Table 5: Robust mean stated selling prices for sets of widely available medicines, by district (TShs)

Set of medicines and statistics	Manyoni	Singida Rural	Rombo	Moshi Rural
(1) 18 tracer medicines (all types of outlet)				
Robust mean price	96.875	87.03	100	99.69
Median price	53.75	45	41.25	47.5
(2) 27 tracer medicines (prescribing outlets)				
Robust mean price	165.16	105.625	137.5	131.16
Median price	62.5	50	43.75	70
(3) 11 tracer medicines (drug shops, all districts)				
Robust mean price	245.31	186.875	145	138.75
Median price	47.5	43.75	35	35
(4) 27 tracer medicines (FBO/NGO outlets all districts)				
Robust mean price	110.625	100.3125	146.875	105.625

Median price	50	50	46.25	60

Prices and selling practices by sector in the Tanzanian rural areas

> *Medicines are characterised by asymmetries of information, and at every step of the supply chain there is this unequal knowledge and people are exploited because of that lack of knowledge* (WHO essential medicines expert[xvi])

One aspect of the dangers of exploitation referred to above is the level of prices: unequal information and vulnerability of medicines users can allow high prices and high mark-ups to persist in unregulated medicines markets, and in many contexts, retail competition does not appear to work to reduce prices. Publications based on the Health Action International / WHO pricing methodology identify local mark-ups at wholesale and retail level as a major influence on affordability of final retail prices (Mendis et al 2007; WHO/HAI 2006).

The NGO sector is not thought to be immune from this problem. As one medicines expert interviewed put it, concerning the NGO sector as medicine suppliers:

> *..they buy* [internationally] *very well…. they are quite expensive afterwards because their system needs mark ups because they are in revolving drug funds. So again, it gives an added price for the individual.*

A recent study by the WHO in collaboration with the Ecumenical Pharmaceutical Network (WHO/EPN 2006) looked closely at international purchasing prices by the faith based wholesalers, but did not explore the prices charged to customers. The Government of Tanzania reports on Tanzanian medicines prices (URT 2006, 2007) show a mixed picture in comparing median prices in private and mission sectors by medicine: some higher and some lower by sector.

The data reported here allow us to measure and compare spread of prices and margins in the private and non-governmental non-profit sectors, between wholesale and retail prices, in four rural districts, and to link this to qualitative interviewing. We ask in this section whether the NGO sector effectively delivers lower prices to medicine users than the private commercial sector? Alternatively, are the drug shops the cheapest outlets? How do retail margins vary by sector?

For medicines that are available from both drug shops and prescribing facilities, the NGO dispensaries and health centres are not cheaper for users than the drug shops

(Table 6). The mean and median prices for the set of 18 widely available medicines are slightly lower for the FBO/NGO dispensaries and health centres than for drug shops, but the differences are not significant. However the median price charged by private health centres and dispensaries for this set of medicines is significantly higher than the median price in rural drug shops or in rural FBO/NGO health centres and dispensaries[xvii]. FBO hospital prices fall between the two.

For a larger set of 27 medicines sold in at least two of each type of prescribing facility, the differences between private and NGO sectors are sharp (Table 6). The prices in the private dispensaries and health centres were significantly higher than in either the FBO/NGO dispensaries or the faith-based hospitals[xviii]. The differences between dispensaries and health centres on the one hand and hospital prices on the other hand within the FBO/NGO sector were not significant.

Table 6: Robust mean stated selling prices for sets of widely available medicines, by type of outlet (TShs)

Set of medicines and statistics	**Private drug shops**	**Private dispensaries / health centres**	**FBO/NGO dispensaries / health centres**	**FBO hospitals**
(1) 18 tracer medicines (all types of outlet)				
Robust mean price	83.75	123.75	80.74	101.25
Median price	47.50	61.25	46.25	46.88
(2) 27 tracer medicines (prescribing outlets only)				
Robust mean price		156.88	116.09	141.56
Median price		100.00	47.5	50

There is also a difference in pricing strategy suggested by the data. The median prices stated by hospitals for the most expensive medicines tend to be lower than for the other types of facilities: the distribution of prices by medicine is more compressed toward the top. FBO hospitals may be attempting to ensure that the most expensive medicines are more affordable in hospitals than elsewhere, and this again is supported by the interviews in facilities:

> *[Pricing of] the more expensive drugs such as insulin is very difficult, since we buy these at a high price and the patient has to take the medicine daily .. we help patients by putting a very small percentage in the selling price of the drug. For cheap drugs it is not really a problem because most of the patients can afford e.g. frusemide.* [FBO hospital doctor and manager, Singida]

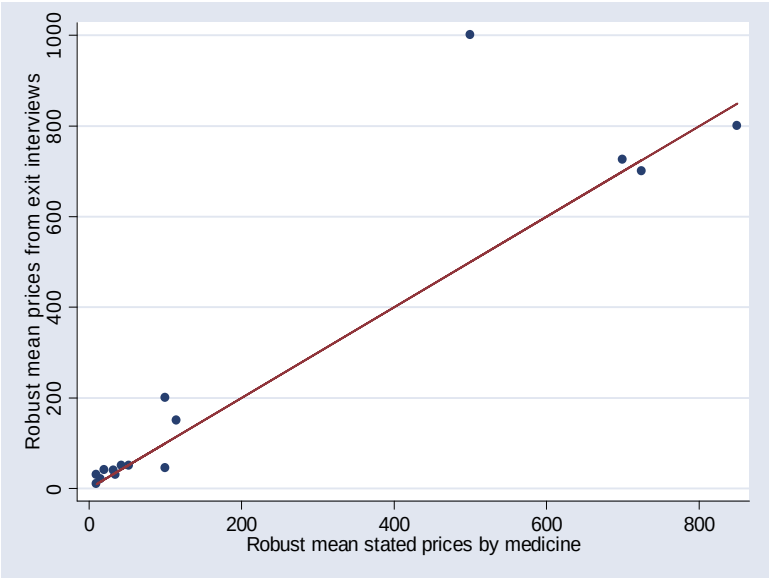
These selling prices are those given by the facilities on their price lists. To what extent do they coincide with the prices that purchasers state that they have paid on exit from facilities? The exit data on prices paid by hospital patients is poor, since patients on exit often lacked a breakdown of the items for which they had paid. For the lower level facilities and drug shops however, we have price data from exit interviews for a set of 15 medicines available in drug shops[xix] and for 9 medicines available in both drug shops and private and FBO/NGO dispensaries and health centres[xx]. Table 7 summarises the findings. The robust mean prices given by buyers on exit from drug shops are predominantly higher rather than lower, medicine by medicine, than prices stated by the shops, but the difference in the median prices for the 15 medicines is not significant. On the whole, the exit interview data suggests that stated prices are quite an accurate reflection of charged prices at drug shops, though there are a few much higher prices charged than stated.

Table 7: Robust mean selling prices: outlets' stated prices and exit interview prices, 15 medicines for which data available (TShs)

Set of medicines and statistics	Stated selling prices	Prices from exit interviews
(1) 15 tracer medicines sold at drug shops		
Robust mean price	156.25	207.50
Median price	52.50	50.00
(2) 9 tracer medicines: drug shops		
Robust mean price	60.00	85.00
Median price	52.50	50.00
(2) 9 tracer medicines: private disp/ h.c.		
Robust mean price	89.38	99.58
Median price	75.00	91.67
(2) 9 tracer medicines: FBO/NGO disp./h.c		
Robust mean price	60.00	71.56
Median price	52.50	75.00

Figure 2 shows the relation of exit prices observed to stated prices, by medicine. The line shows the stated exit prices; the scatter is the robust mean purchase price recorded in the exit interviews; scatter points above the line imply that exit interview prices are higher than shops' stated list prices, scatter points below the line are lower prices.

Figure 2: Rural drug shops, robust mean prices from exit interviews compared to robust mean stated prices, 15 medicines (TShs)



For the set of 9 common medicines for which we have exit price data across the sectors, not only are stated prices higher in the private dispensaries and health centre, but also the gap between exit price interviewees' recorded prices and those stated by the outlet appears to be larger than in the FBO/NGO sector. Private dispensaries charging prices above list price appears particularly to occur for higher priced medicines. Figure 3 shows the example of SP tablets, a widely used anti-malarial at the time of the survey, widely available in drug shops. As Figure 3 shows, the prices reported by exit interviewees in the private sector (drug shops and one private facility) were in many cases substantially higher than the stated list prices in the shops. A similar pattern was found for diclofenac, a widely used analgesic.[xxi]

Figure 3 Prices reported by exit interviewees for SP tablets, compared to list prices for the same facilities, by sector (numbers on points, 1=private, 2 FBO/NGO) (Tshs)

The exit interviews also provide information on the medicines availability and prescribing practices of the drug shops and other outlets by sector. Buyers were significantly less likely to find the drugs they sought in the private as compared to the FBO/NGO sector (Table 8), and 8.5% of drug shop interviewees had found none of the drugs they sought. Just 35% of people interviewed at drug shops had a prescription, compared to a large majority in other outlets: drug shops are largely sites for self-medication. A large majority of interviewees at drug shops were paying for themselves, while in the higher level facilities around a third were being paid for by relatives and friends. Only at hospitals were more than a tiny proportion (15%) of interviewees funded by an organisation or fund (Table 8). Interviewees were significantly more likely to receive a part-dose rather than a full dose in drug shops, and more generally in the private sector than in the FBO/NGO facilities. There is thus evidence of better prescribing behaviour in the non-governmental non-profit sector. Finally, payments in drug shops were significantly[xxii] lower than in the prescribing facilities, reflecting in part the cheaper range of medicines largely sold in the shops.

Table 8: experience of exit interviewees by type of outlet.

Characteristic	**Private drug shop**	**Private disp. /h.c.**	**FBO/NGO disp. / h.c.**	**FBO hospital**	**Total**
Had a prescription (%)	35.29	93.75	85.59	98.18	**66.38**
Found some or all drugs unavailable (%)	13.73	12.50	5.36	0	**8.81**
Unable to afford some or all of available drugs (%)	8.45	12.50	9.09	0	**7.67**
Funds provided by self (%)	83.56	68.75	61.82	63.64	**72.01**
Funds provided by relatives or friends (%)	14.39	28.13	33.64	21.82	**23.03**
Funds provided by organisation or Fund (%)	2.05	3.13	4.55	14.55	**4.96**
Received part not full dose (%)	25.71	15.63	10.00	0	**15.48**
Mean payment (Tshs)	824.38	1468.96	1558.54	1723.92	**1212.89**
Median payment (Tshs)	500	1000	1282.5	1200	**800**

Prices by country of origin

> '*You can get the best drugs from India, but at the same time many Indian drugs are very fake. I am always very suspicious of Indian drugs.* [Doctor, FBO hospital, Singida]
>
> '*What I can say is that people like drugs from outside….I see that [Tanzanian drugs] are effective since we use them and they cure'* [FBO hospital manager, Singida]

The market for essential medicines in rural Tanzania is dominated by medicines from three countries: Tanzania itself, Kenya and India. Both medicines buyers and professionals have opinions about medicines from the different sources, and in each case there are reputational problems. There have been bad experiences with Indian medicines in the past, and this is still influencing opinion; clinicians and pharmacists prefer to obtain Indian medicines from the government buying agency (MSD) whose quality control is reasonably well thought of (though not universally trusted) according to the interviews in facilities:

> *We rarely buy Indian drugs; most Indian drugs here are from MSD.* [Manager FBO hospital Singida]
>
> *It is difficult to comment on Indian drugs …since we mostly rely on MSD so we are sure of the quality* [Doctor FBO hospital Kilimanjaro]

MSD also buys Tanzanian and Kenyan medicines and distributes them. When medicines are purchased from the private wholesalers, the facilities and shops rely on the reputation of particular wholesalers and have no way of checking quality.

Table 9 shows the origin in the rural survey of all observations of stocks of our 31 tracer medicines.

Table 9: frequency count: occurrences of each medicine in rural survey, by country of origin (number of cases where country of origin recorded)

Medicine	Tanzania	Kenya	India	Europe	Other	Total
Acylovir			11	5		16
Albendazole Suspension	27		6	1	1	35
Amodiaquine Suspension	30	20	5			55
Amoxycillin Suspension	17	12	12	1		42
Ampicillin	16	4	1	1		22
Atenolol		1	2	11	3	17
Ceftriaxone Injection			14	3		17
Chloramphenicol Injection			24	1		25
Ciprofloxacin	26		17			43
Clotrimazole Cream	12	26	14			52
Diclofenac	35	2	38	3		78
Doxycyclin	21	3	2	3		29
Erythromycin	29	1	6	3		39
Ferrous Hydroxide +Folic Acid Syrup	10		5			15
Fluconazole	3	1	12			16
Frusemide		23	5	6	2	36

Gentamycin Injection	2		25	2	8	37
Mebendazole	34	12	8	6		60
Metronidazole	38	7	6			51
Omeprazole			24	1		25
Paracetamol	71	6	2			79
Phenobarbitel	23	10				33
Praziquantel	22	2	2	1		27
Prednisolone	1	29	5	3	2	40
Promethazine	6	15	16	3	3	43
Quinine	40	1	5	4		50
Salbutamol	1	30	19	1	4	55
Sulfadoxine Pyrimethamine (SP)	46	24	8	3		81
Sulfamethoxazole + Trimethoprim	14	2	3			19
Stavudine + Lamivudine + Nevirapine 30	1		6			7
Stavudine + Lamivudine + Nevirapine 40	3		4			7
Total (% overall total)	528 (46%)	231 (20%)	307 (27%)	62 (5%)	23 (2%)	1151 (100%)

Nearly half (46%) of recorded observations of the tracer medicines were medicines from Tanzania; the most widely available basic medicines, including paediatric suspensions, basic antibiotics and anti-malarials, and analgesics, were all available and widely stocked in Tanzanian versions. Only the injectables, some chronic illness medicines and one antibiotic were solely available as imports. First-line combination ARVs had just begun to be locally produced and were found in some FBO hospitals surveyed. India supplied a larger proportion (27%) of the items recorded than Kenya, the other major import source (20%), and India was the sole non-European source of the injectables in our tracer list.

India is thus the dominant long-distance source of imports, but has African manufacturing competition for most our other tracer medicines. China was almost absent as a source of the rural medicines surveyed, and the price data suggest most European imports found in rural areas, except for a few items from Malta and Cyprus, are highly subsidised (perhaps as donations). The proportions from the three main country sources are very similar for private and non-profit sectors, despite the very different mix of medicines.

Because of the known importance of Indian suppliers to the Tanzanian market and the changing strategies of Indian firms[xxiii], the project particularly examined the India-Tanzania supply chain. Indian firms are internationally regarded as low cost suppliers of essential medicines, and the Indian import prices are benchmarks in the East African markets[xxiv]. We might expect therefore that if markets are competitive, there may be little difference between selling prices of Indian and medicines of other countries of origin. Alternatively, since Indian medicines are sometimes regarded by Tanzanian buyers as of doubtful quality, they may sell at a discount to Tanzanian and Kenyan medicines.

Comparing average rural selling prices of medicines by country of origin does not identify significant differences between prices by the main country of origin. As Table 10 shows, the averages suggest somewhat higher Indian prices compared to both African and European sources, but the differences are not significant[xxv].

Table 10: Robust mean stated selling prices for sets of widely available medicines, by country of origin (TShs)

Set of medicines and statistics	Tanzania	Kenya	India	Europe
(1) 17 tracer medicines (1 case by main countries)				
Robust mean price	92.5	110.94	153.75	n/a
Median price	45	40	45	n/a
(2) 18 tracer medicines (1 case from India and Europe)				
Robust mean price	n/a	n/a	106.25	80.94
Median price	n/a	n/a	52.5	48.75

We also have information on the manufacturers by country of origin of medicines found in the survey. From Tanzania, the dominant manufacturer of the tracer medicines was Shelys (20 of the 31 tracer medicines), followed by TPI, then Interchem and then Keko. From Kenya, the dominant supplier found in the rural outlets was Elys (14 of the tracer medicines), followed by Lab. & Allied, Regal, and Cosmo. From India, the manufacturers whose products were found in the rural outlets were diverse (38 in all). The predominant sources were not in general the leading Indian exporting firms; those manufacturers from whom five or more tracer medicines were found in rural outlets were Intas (7), Simrone (6), Aurochem, Lincoln, Medopharm and Emcure (5 each); the last supplied some of the ARVs in the list.

Competition and margins in rural areas

Tanzanian rural medicine distribution faces huge challenges: access to reliable supplies at decent prices; long transport routes and poor storage; and physical and financial access difficulties for patients among them. In many rural districts, distances between facilities and shops are also long, and patients may have little choice of facility and retail outlet. One might expect therefore that competition would be limited, prices variable and margins high. There is also a view in the literature that many problems of medicines prices are found in the business behaviour of shops and facilities.

We explore here three indicators of competition and market power: buying prices, price dispersion and level of margins. This section examines this issue for rural areas, and the next compares the data to urban and wholesale charging policies.

Buying prices are an indication of market power and the impact of regulation. Since FBO facilities have access to government and NGO large scale purchasing, including aid-funded buying on the 'social' international market[xxvi], we would expect their buying prices to be lower than those of drug shops which have to buy from local private wholesaler and importers. This is in fact the case: the drug shops are buying at consistently higher prices than the facilities in general, and the private facilities (which are few in number in the sample) also have relatively high buying prices. Tables 11 and 12 show the evidence in terms of average buying prices and margins, for each of the 18 medicines available in both drug shops and facilities, for drug shops as compared to private and FBO/NGO facilities.

For buying prices, the robust mean prices by medicine are generally higher for drug shops and the private facilities than for the FBO/NGO facilities as a group. For some medicines, despite the small sample, the differences are significant, as they are over all (Table 11). The FBO/NGO facilities have access to less expensive medicines than the private sector.

Table 11: robust mean buying price by medicine and type of rural outlet, 18 medicines found in all types of output (Tshs)

Medicine	Drug shops	Private hc/disp	FBO/NGO facilities	No. of cases (total)	Significance (drug shops vs FBO/NGO)
Acylovir	156.5	200	231.25	12	*
Amodiaquine Suspension	450	437.5	395	41	**
Amoxycillin Suspension	487.5	450	456.25	32	
Ampicillin	20.75	18	19.75	18	
Ciprofloxacin	45.625	45	38.5	34	
Clotrimazole Cream	500	475	400	42	**
Diclofenac	10.875	8.625	7.5	60	**
Mebendazole	5	5	4.25	52	*
Metronidazole	4.5	5.5	4	42	
Omeprazole	43.75	42.5	43.75	20	
Paracetamol	4	4	4	66	
Phenobarbitel	4.25	6.125	4.125	33	
Praziquantel	136.5	152.75	118.125	20	
Prednisolone	9.5	11.875	8.5	34	
Promethazine	3.75	6.25	3.5	38	
Quinine	29.875	33.75	30.5	39	
Salbutamol	4.75	4.75	3.5	48	**
Sulfadoxine Pyrimethamine (SP)	53.375	48.5	28.875	65	*
Robust mean 18 medicines	**47.97**	**52.66**	**42.72**		***

* significant buying price difference at 10% level (ttest with unequal variances)
** significant buying price difference at 1% level (ttest with unequal variances)
*** significant buying price difference at 10% level (signtest of differences between medians)

As shown above, these higher buying prices are passed on to purchasers of medicines as higher selling prices in the private than in the non-profit facilities; however on average the drug shop prices did not appear to be higher than those in the FBO/NGO facilities. This would suggest that drug shops may be charging lower margins than the facilities. Table 12 examines average margins by medicine for the same medicines as in Table 11. 'Margin' is calculated as :

*(stated selling price- stated buying price)/stated buying price * 100* .

Table 12 shows that where there are significant differences by medicine between drug shop and FBO/NGO margins, the drug shop margins are lower. There is thus some evidence of competition with the FBO sector squeezing drug shop margins.

Table 12: robust mean margins by medicine and type of rural outlet, 18 medicines found in all types of output (%)

Medicine	Drug shops	Private hc/disp	FBO/NGO facilities	No. of cases (total)	Significance (drug shops vs FBO/NGO)
Acylovir	152.51	107.70	33.33	12	
Amodiaquine Suspension	55.56	47.22	51.04	41	
Amoxycillin Suspension	75.56	116.67	69.18	32	
Ampicillin	70.83	66.67	79.69	18	
Ciprofloxacin	172.22	278.41	183.93	34	*
Clotrimazole Cream	38.33	88.48	81.13	42	*
Diclofenac	230.66	468.45	433.33	60	**
Mebendazole	266.67	583.33	293.75	52	
Metronidazole	222.62	204.17	520.83	42	**
Omeprazole	153.97	137.8	132.14	20	
Paracetamol	137.5	150	170.83	66	
Phenobarbitel	104.17	147.22	171.875	33	**
Praziquantel	81.32	130.04	113.54	20	
Prednisolone	189.58	108.93	98.21	34	
Promethazine	254.17	406.25	212.5	38	
Quinine	81.77	118.75	62.46	39	
Salbutamol	137.5	145.83	400	48	**
Sulfadoxine Pyrimethamine (SP)	108.68	194.76	295.21	65	*
Robust mean 18 medicines	**136.475**	**149.18**	**169.1**		*****
Robust mean 26 medicines	**109.41**	**151.81**	**136.4**		******

* significant margin difference at 10% level (ttest with unequal variances, or paired)
** significant margin difference at 1% level (ttest with unequal variances or paired)

Another way of investigating market competitiveness and its limits through the use of price data is by examining price dispersion. A narrow range of prices suggests effective price competition as a result of patients ‘shopping around’; a wide range suggests a lack of such price competitive pressure. Patterns vary, but here are two fairly typical examples. The first (Figure 4) shows data for salbutamol tablets sold in rural areas, and is an example of a medicine with widely dispersed buying prices between facilities, where FBO/NGO facilities are buying more cheaply than drug shops, a strong ‘going price’ suggesting competitive pressure and shopping around for a standard medicine, and strongly squeezed drug shop margins.

Figure 4: Salbutamol tablets: distribution of buying and selling prices and margins, for rural drug shops and rural FBO/NGO facilities only (omitting private facilities)

Figure 4(a) Buying prices

Figure 3(b) Selling prices

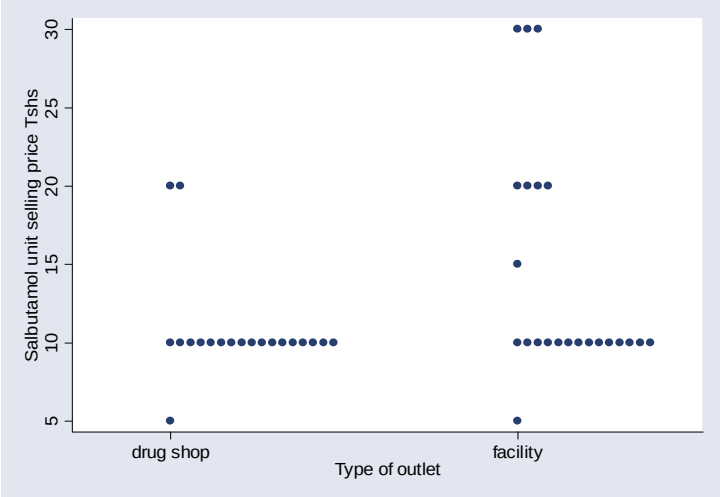


Figure 3(c) Margins

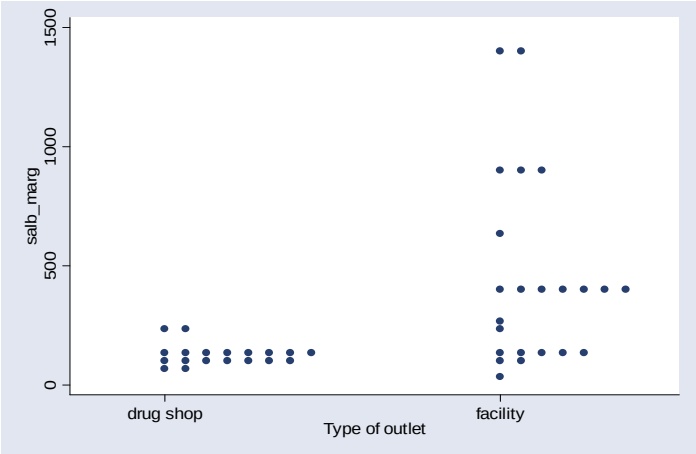


Figure 5 shows a different pattern, for clotrimazole cream, a pattern that also characterises other less standard items than widely used tablets, such as paediatric suspensions. These show a much less compressed distribution of buying and selling prices suggesting less competition, though the more efficient buying by the non-profit

facilities is still visible. Patients face a wide range of prices for this item, according to the particular shop or FBO/NGO facility visited – there is no ‘going price’ to rely upon. For clotrimazole cream, some significant relative compression of drug shop margins is still visible; for the paediatric suspensions, and for items infrequently or only unofficially available in drug shops such as some antibiotics, this is not the case (Table 11).

Figure 5: Clotrimazole cream: distribution of buying and selling prices and margins, for rural drug shops and rural FBO/NGO facilities only (omitting private facilities)

Figure 5(a) Buying prices

Figure 5(b) Selling prices

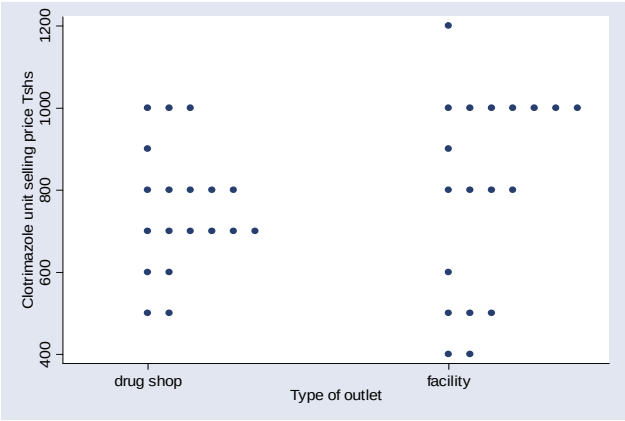
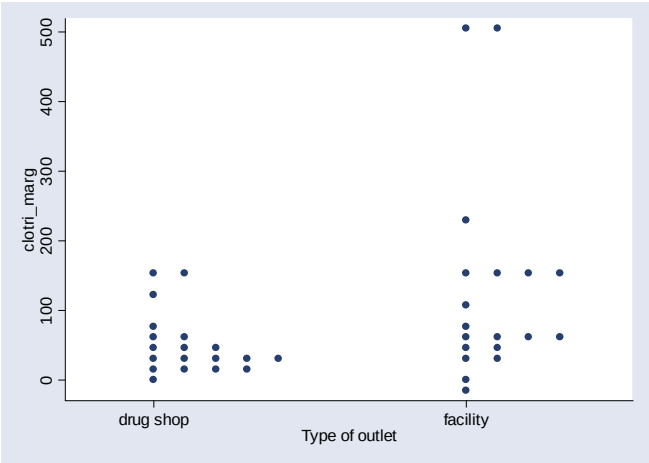
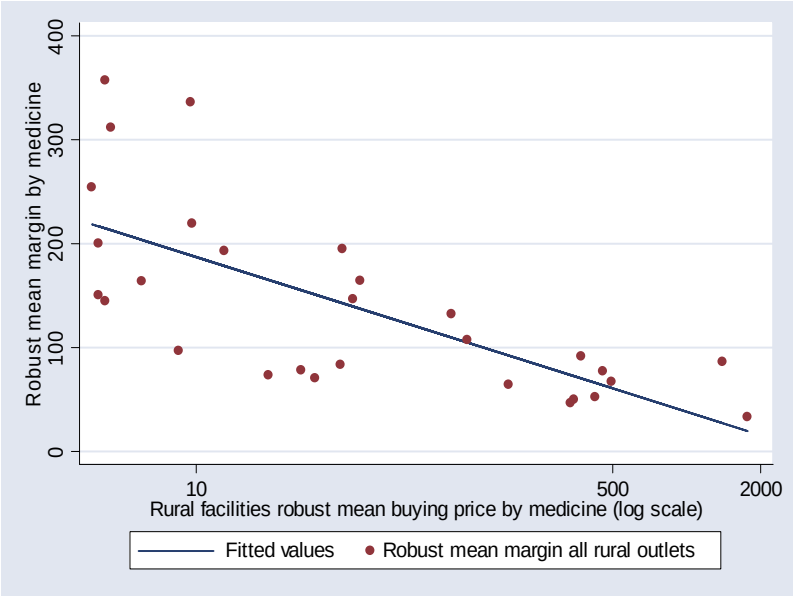


Figure 5(c) Margins



The facilities and shops all charge for medicines and use the margins to support their running costs. As expected therefore in this commercial but very income-constrained environment, the margins charged tend to be inversely related to buying prices: cheaper drugs attract higher percentage margins where outlets think this affordable; more expensive medicines require lower percentage margins to provide profit and because they are less affordable for the population. Figure 6 illustrates the point, using a log scale to make the relationship clearer; the inverse relationship is strongly significant[xxvii]. The same type of relationship holds for the shops and facilities in each sector considered separately[xxviii].

Figure 6: Rural outlets: robust mean margin by medicine regressed on log of robust mean buying price by medicine (% margin, buying price Tshs log scale)



Price performance of wholesalers: buying prices and margins

The import and wholesale market is very price-competitive … MSD is a very large part of the market, which keeps prices down. [Private wholesaler, Dar es Salaam]

In the market as a whole, MSD plays a very prominent role .. they run very competent tenders [Private wholesaler, Dar es Salaam]

An important claim by non-governmental non-profit and governmental buying agencies is that they are able to buy at lower cost than private wholesalers, and to pass those lower prices on to customers. Conversely, the private wholesalers in Dar es Salaam and Arusha claim that they are subject to fierce wholesale competition, that can pare their margins down as low as 5% or 10%, though *'prices are very volatile'* in private wholesale. It is hard to get an estimate of MSD's share of the market – the occasionally quoted 80% is likely to be a considerable over-estimate – but it is clear that it plays a role in competing down retail prices. The impact would be greater, were the organisation not subject to regular shortages of supply ('stock outs') of which our facility interviewees repeatedly complained. MSD buys both imports and Tanzanian medicines: they estimated in 2006 that 60% of their purchases were from India, another 10% other imports, and around 30% from Tanzanian sources, by value[xxix].

We can use our data to test the NGO and government claims about efficient purchasing. We have buying and selling price data for three non-profit wholesalers, including the autonomous government buying agency, the Medical Stores Department (MSD); reasonable buying price data from one commercial wholesaler, and patchier buying or selling price data from two others. In addition, we know that the drug shops and private facilities cannot buy from the non-profit wholesalers, so their buying price data gives us selling prices from commercial wholesalers. As noted above, the FBO/NGO facilities do consistently purchase at lower prices than the private facilities in rural areas.

Buying prices recorded for the non-profit wholesalers are indeed on average significantly[xxx] lower than the commercial buying prices for our tracer medicines. Average[xxxi] margins for those medicines, at the non-profit wholesalers was 28.2%, with a quite small range of 2.47% to 67.84%, bearing out the non-profit wholesalers' claims to restrict their margins generally to around 25%. This is the margin between buying price and wholesale warehouse door price. We do not have equivalent data for the private sector.

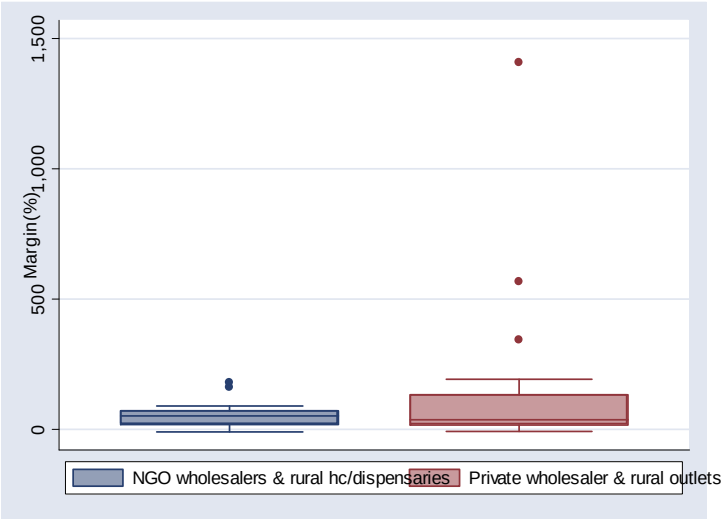
We can however make a rather different comparison, comparing the buying prices in each wholesale sector with buying prices by the rural private and rural non-governmental buyers. To make the comparison as useful as possible we make the non-profit comparisons with and without the rural hospitals (which can sometimes have delivery arrangements), and the private comparison with private shops' alone and also including private facilities' (which tend to pay more). In each case, the pairwise comparisons use the same set of medicines.

As Table 13 suggests, there are no significant differences between the mean and median margins between the sectors, calculated on this basis. The data support the private wholesalers' general argument that they are under competitive price pressure (though not their claims to have margins of only around 10%). However, the private sector mean margins by medicine are much more dispersed than the non-governmental sector margins (Figure 7). The wholesale pricing strategies thus appear to be different, in a manner reflected in the interviews : the non-profit wholesalers add a fairly standard margin, that does not vary hugely by medicine; the private wholesalers will make a substantial margin where they see an opportunity, and may lose money where there is a glut of a particularly medicine on what is a thin and patchy market.

Table 13: Robust mean wholesale margins, wholesaler buying price compared to rural buying price, by sector for stated sets of medicines (%)

Set of medicines and statistics	**Non-profit wholesalers and all rural FBO/NGO facilities**	**Non-profit wholesalers and rural FBO/NGO hc/dispens.**	**Private wholesalers and rural private outlets**	**Private wholesalers and rural drug shops**
(1) 24 medicines				
Robust mean margin	38.69	47.80	54.92	
Median margin	39.52	51.60	36.12	
(2) 22 medicines				
Robust mean margin		50.26		48.33
Median margin		53.43		21.46

Figure 7: Margin between robust mean wholesale buying prices and rural outlet buying prices, by medicine: non-profit wholesalers and FBO/NGO health centres and dispensaries; private wholesalers and all rural private outlets (%)



Domestic and international prices

The final step in the analysis of prices along the supply chain is to compare Tanzanian medicines prices to international reference prices. There are three ways to do this: to use landed prices in Tanzania (from TFDA sources); to compare the Tanzanian prices (both for Indian-sourced and other medicines) to India prices, either manufacturers' warehouse prices or wholesale or retail reference prices; and to compare them to international reference prices drawn from the MSH annual price survey. The use of landed prices has not so far been possible, due to problems of unit price data from the import records[xxxii]. We are planning if possible to create comparisons with Indian prices. This section employs international reference prices, taken from international publication and project interviews, to create some evidence on pricing along the international supply chain.

The international reference price used here is the robust mean of prices given – in both interviews and in the MSH reference price publication (MSH/WHO 2007) – by the international specialist wholesalers which are consistently the most competitive on price. The data are translated into Tanzanian shillings and compared with the buying prices given by the government and non-profit wholesalers. As Table 14 shows, both types of wholesalers – and particularly the government buying agency - appear to be performing well in prices achieved in wholesale purchases. We should expect that large tenders and large orders would achieve lower prices than the international reference prices, which are the list prices given for small warehouse door purchases from European-based wholesalers (Tetteh 2008; Mackintosh 2008).

The prices given in Tanzania are substantially below the reference prices in most cases, suggesting that the not-for-profit sector in Tanzania is being supplied on

competitive price terms. On average, for medicines bought by both non-profit and government wholesalers, the non-profit buyers were buying at around 87% of reference prices on average (not allowing for transport cost), while the government was achieving 57% (Table 14).

Table 14: robust mean wholesale buying prices, and international wholesale reference selling prices, by tracer medicine, 2006/ early 2007 (TShs)

Medicine	Non-profit independent wholesaler in Tanzania	Government wholesaler in Tanzania	International reference price*	Non-profit/ government to international reference price (%)
Acylovir			26.80	
Albendazole Suspension	217.50		321.75	68 / …
Amodiaquine Suspension		260.40	244.53	… / 106
Amoxycillin Suspension	378.18	332.50	531.06	71 / 63
Ampicillin			16.51	
Atenolol	19.80		18.27	108 / …
Ceftriaxone Injection	1425.00	272.80	1099.00	130 / 25
Chloramphenicol Injection	350.00	148.32	377.02	93 / 39
Ciprofloxacin	33.00		32.65	101 / …
Clotrimazole Cream	274.50		243.03	113 / …
Diclofenac	6.00	3.90	7.01	86 / 56
Doxycyclin	14.50		14.85	98 / …
Erythromycin	24.75	18.00	30.72	81 / 59
Ferrous Hydroxide + Folic Acid Syrup				
Fluconazole	253.00		252.88	100 / …
Frusemide	6.30	3.25	4.42	143 / 74
Gentamycin Injection	201.63	56.00	82.77	244 / 68
Mebendazole	3.22	2.68	5.63	57 / 48
Metronidazole	3.83	2.43	5.27	73 / 46
Omeprazole	25.00		18.00	139 / …
Paracetamol	3.41	3.22	4.49	76 / 72
Phenobarbitel			5.38	
Praziquantel	93.00	103.35	105.64	88 / 98
Prednisolone	5.55	3.96	9.00	62 / 44
Promethazine	2.32	2.18	3.48	67 / 63
Quinine	36.00	21.74	43.38	83 / 50
Salbutamol	3.00	1.17	2.83	106 / 41
Sulfadoxine Pyrimethamine (SP)	24.00	17.38	22.69	106 / 77
Sulfamethoxazole + Trimethoprim			10.07	
Stavudine + Lamivudine + Nevirapine 30			222.32	
Stavudine +				

Lamivudine + Nevirapine 40			232.18	
Robust mean prices 16 common medicines	**45.31**	**25.99**	**32.69**	**87 / 57**

* TShs equivalent of robust mean dollar price given by the two generally most competitive international 'social' wholesalers – one non-profit, one commercial; source, interviews and price lists[xxxiii]. Exchange rate 30.10.06 US$1=TShs 1287.

Finally, we use these prices to illustrate four examples of the pattern of individual medicines' prices and margins along the international supply chain. We have chosen four examples of medicines with distinct supply chain characteristics. The SP tablets which were the most common first-line malaria treatment at the time of the study have, as noted about, a competitive retail market, and are widely available. Figure 8 shows the evidence of over-charging and expensive sale of brand name versions, also noted above. Margins are high – around 300% - in rural FBO/NGO facilities for this relatively inexpensive medicine, though lower in the drug shops and private facilities which have to pay more for their supplies[xxxiv]. Wholesale buying prices are highly competitive, and the wholesale selling prices in the private market appear to be influenced by the Tanzanian manufacturers' wholesale prices, though the local manufacturers displayed big selling price disparities. The big wholesalers were all buying substantially below international reference prices.

The second example (Figure 9) is also for a common locally manufactured medicine, but with a different market pattern : mebendazole tablets. Prices varied greatly, with evidence of charging above list prices and very high margins especially in the private facilities. Wholesale mark-ups appear to be higher on average than for SP, and the Tanzanian manufacturers' prices highly competitive. Again, the private wholesalers are selling on average at prices above those of non-profit wholesalers, and the wholesale buying prices are well below international reference prices.

Figures 10 and 11 show the supply chain, finally, for more expensive and less widely available items. Amodiaquine suspension (Figure 10) is produced locally as well as imported, and is widely available. It is expensive, and prices are highly variable at all stages in the chain. Margins are much lower at retail level than the margins on tablets, and the gap found for tablets between urban and rural buying prices is not evident. Wholesale buying prices are much closer than for the tablets to the international reference prices, and Tanzanian manufacturers' prices are competitive. Finally,

injectable chloramphenicol is an example of an item with no local Tanzanian production (Figure 11). Again there is considerable price variability, but we have no exit interviewee data for checking price lists. The item was not found in the drug shops interviewed. Average margins are again lower than for tablets, and there is a great deal of price variability. MSD is an efficient buyer of this item, achieving much lower prices than other wholesalers.

Figure 8: SP tablets : supply chain prices

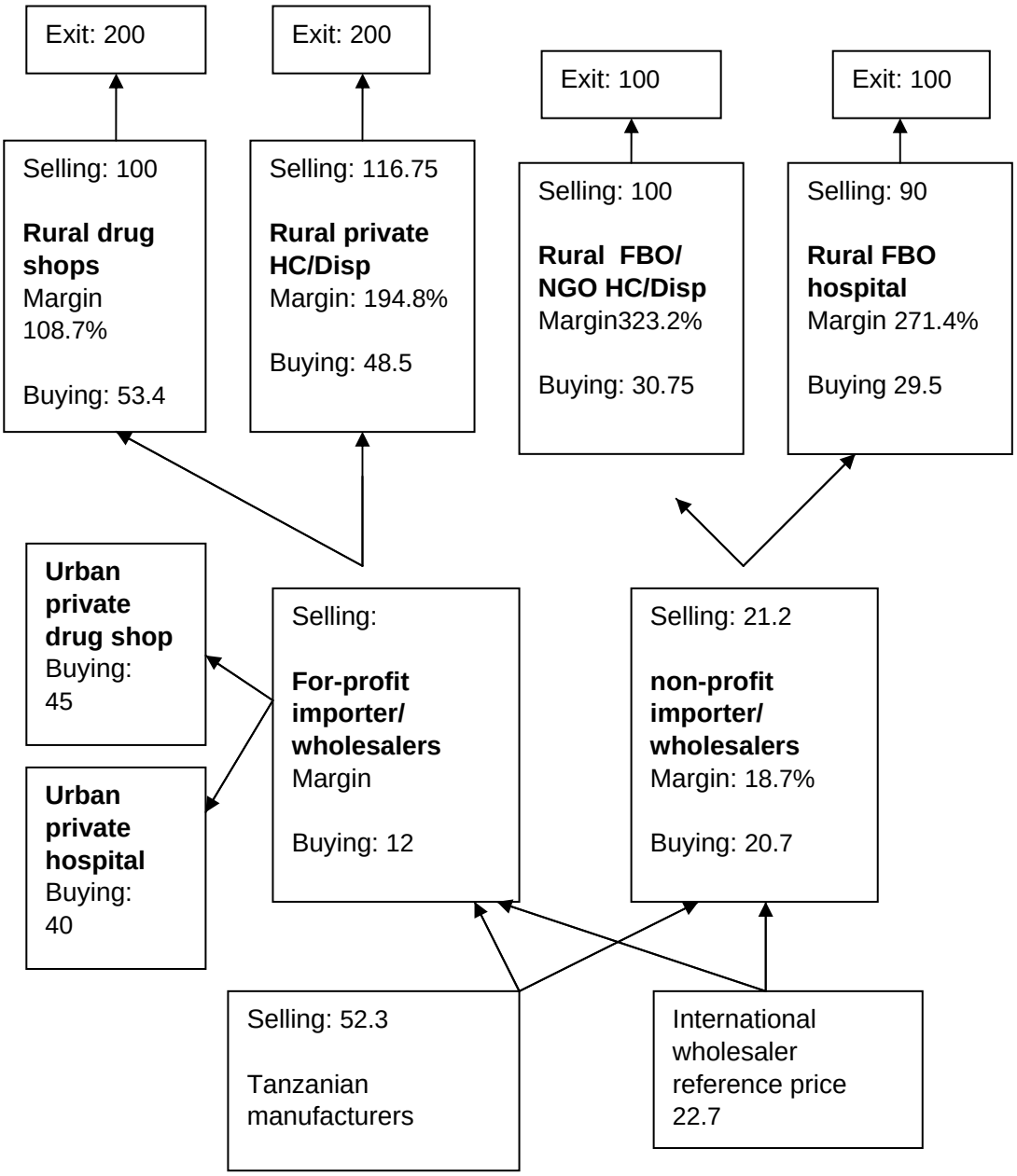


Figure 9: Mebendazole tablets : supply chain prices

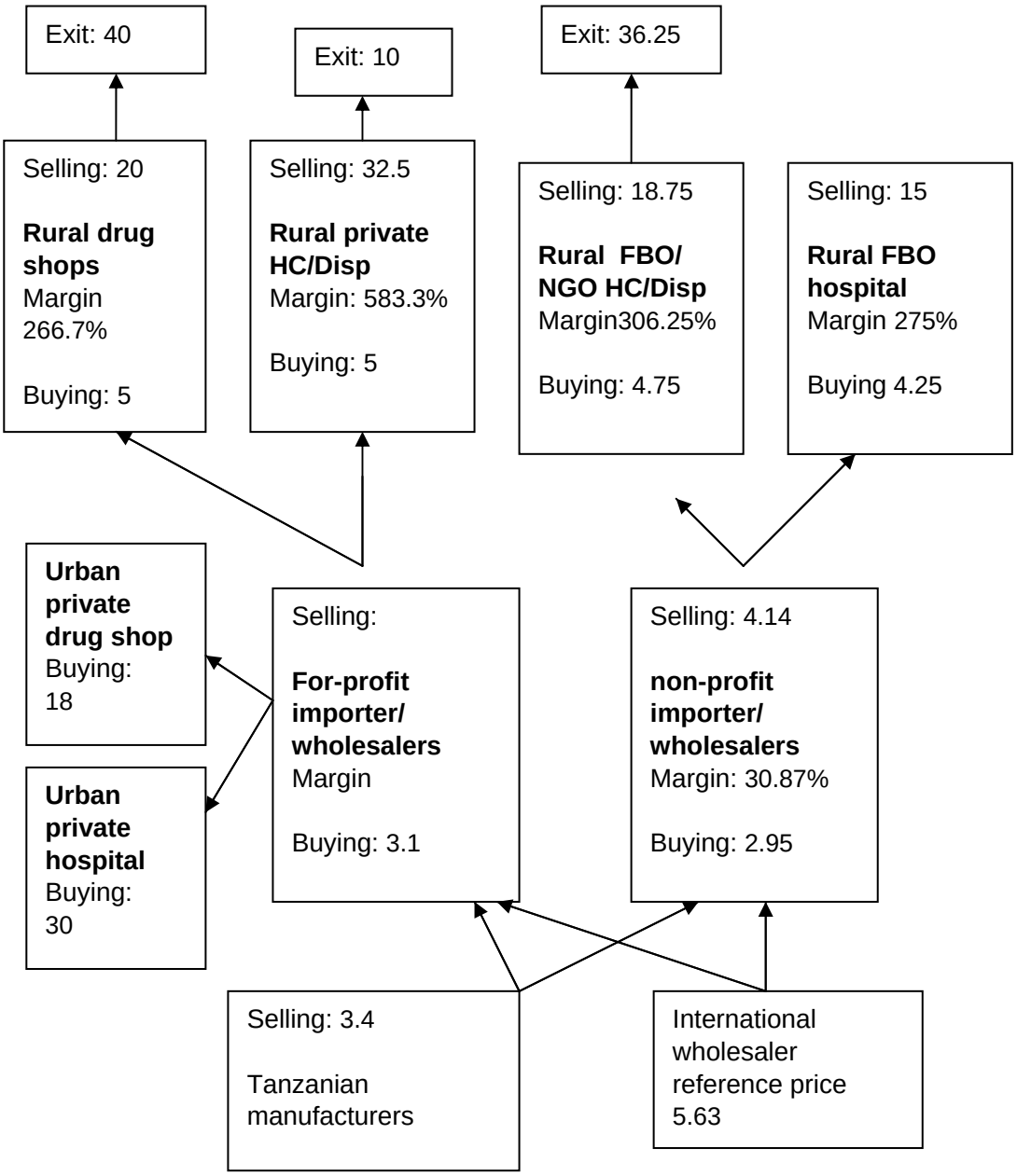


Figure 10: Amodiaquine suspension : supply chain

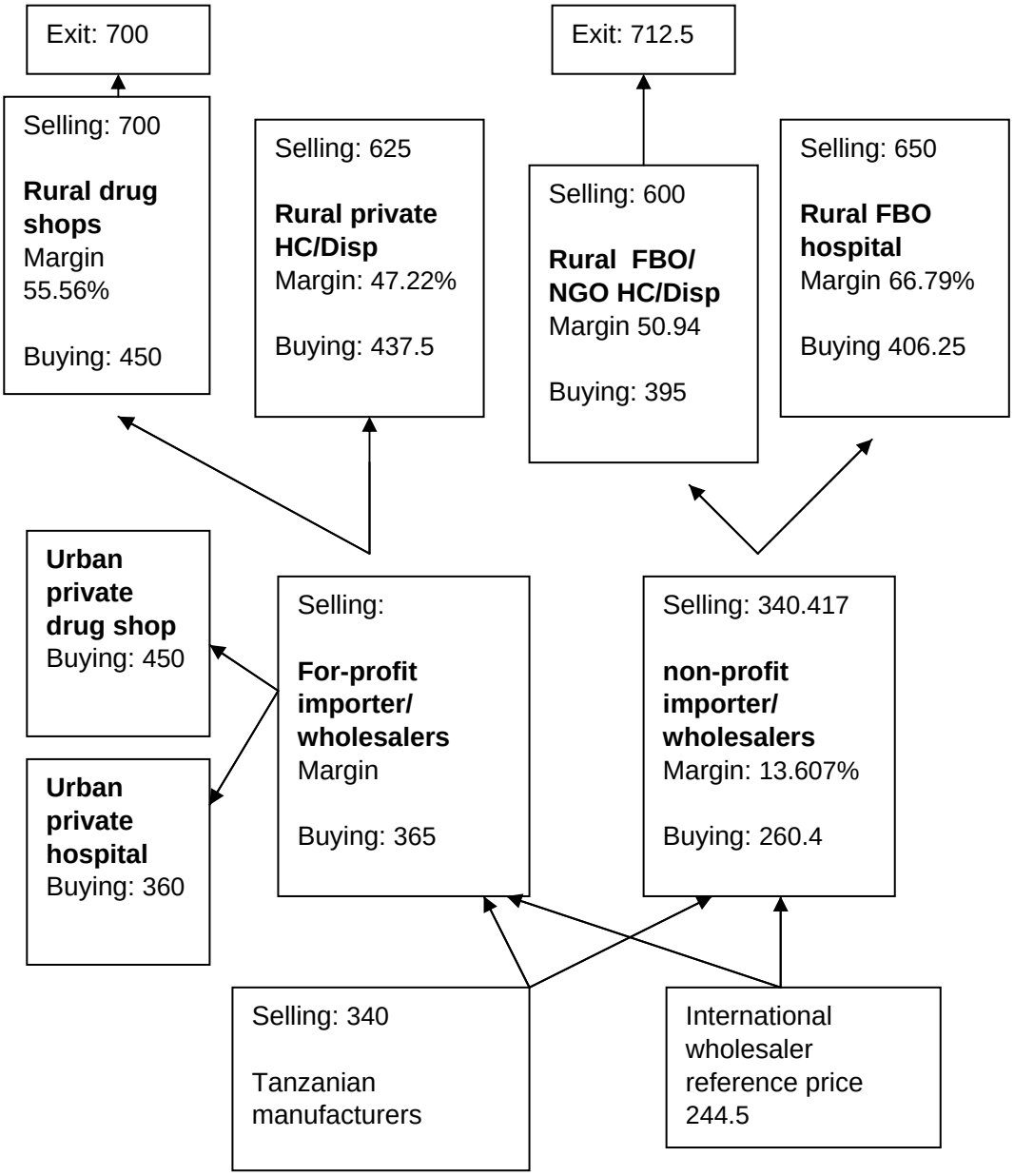


Figure 10: Amodiaquine suspension : supply chain

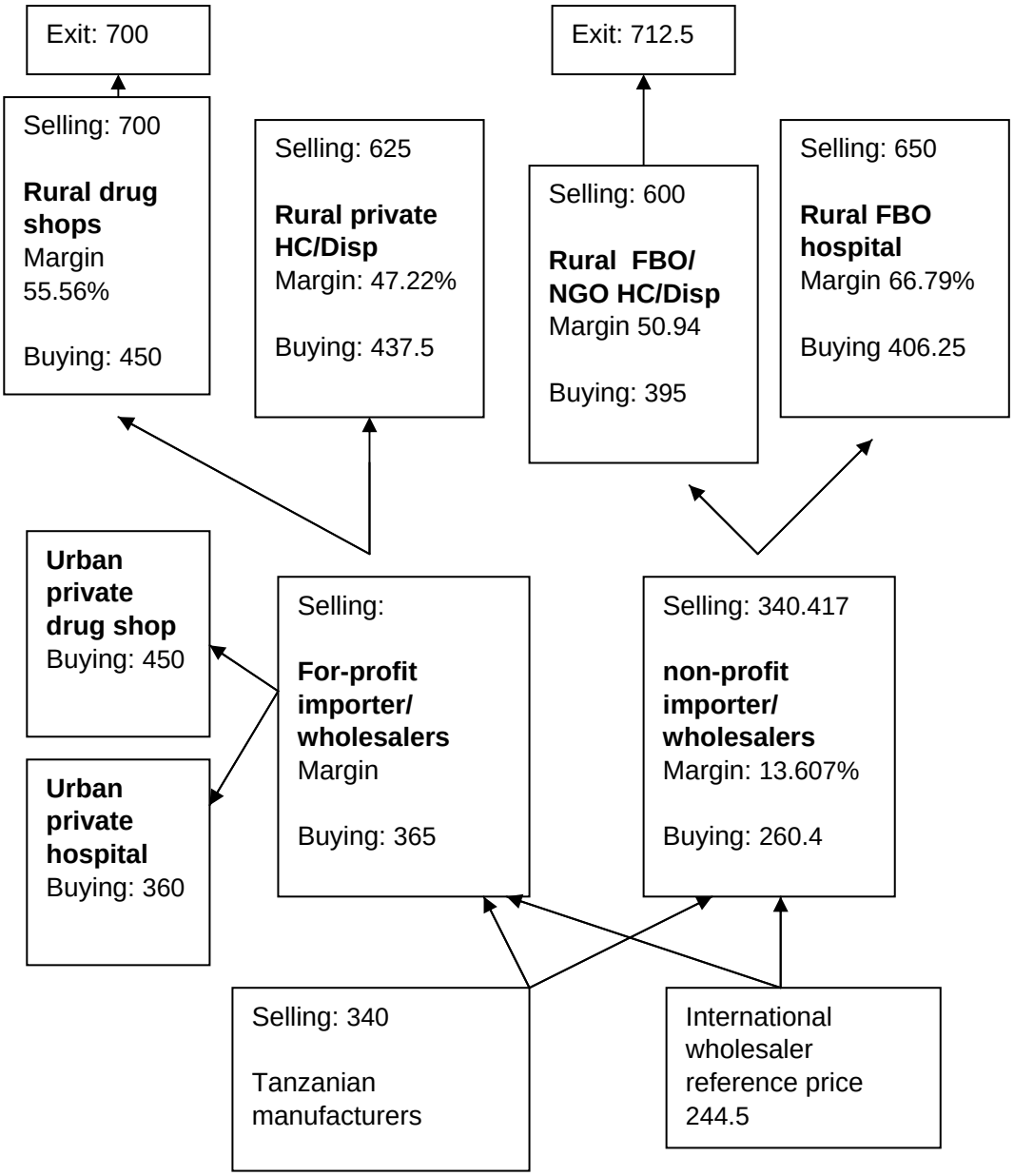
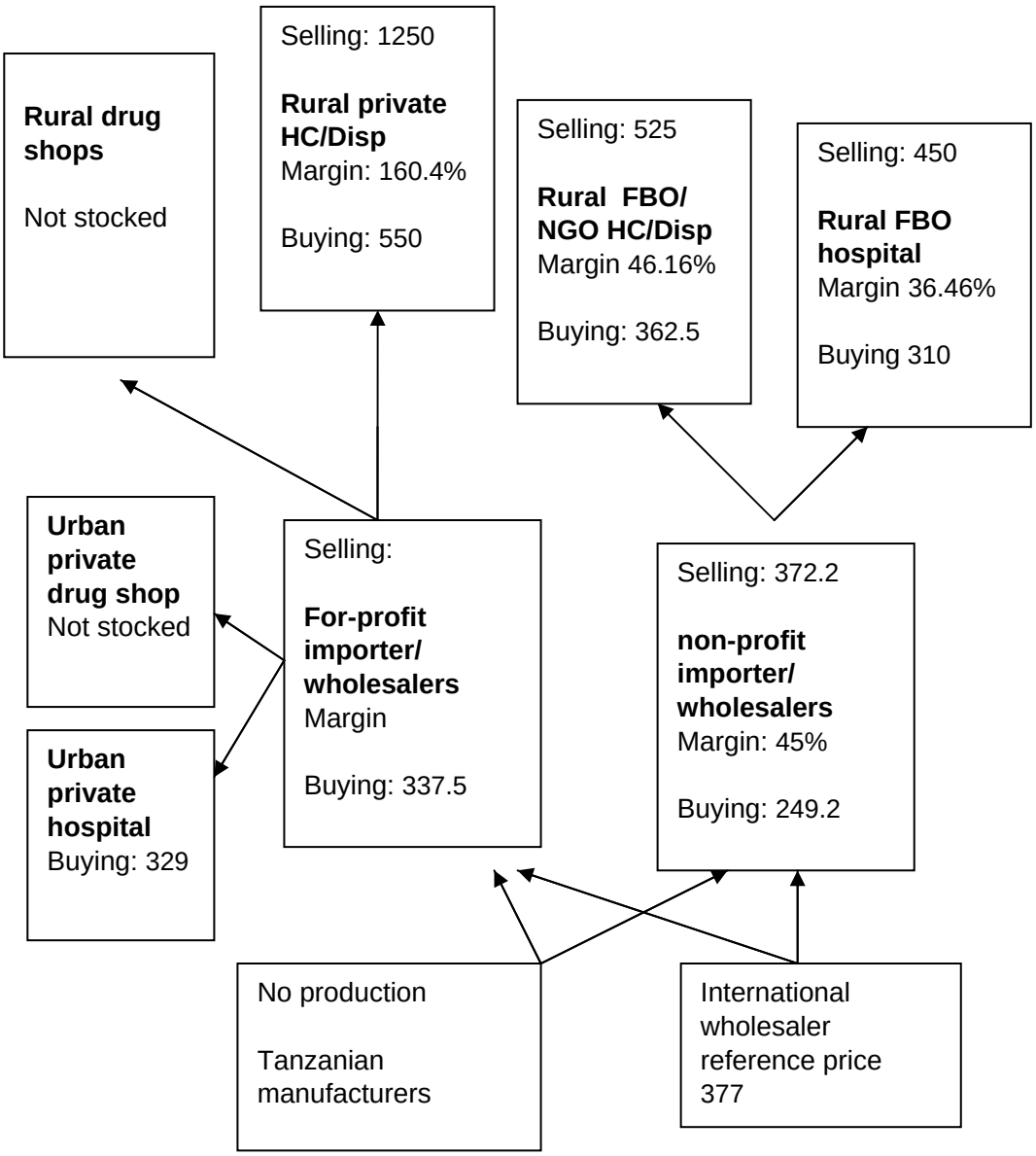

Exit: 700
Exit: 712.5
Selling: 700
Rural drug shops
Margin 55.56%
Buying: 450
Selling: 625
Rural private HC/Disp
Margin: 47.22%
Buying: 437.5
Selling: 600
Rural FBO/ NGO HC/Disp
Margin 50.94
Buying: 395
Selling: 650
Rural FBO hospital
Margin 66.79%
Buying 406.25
Urban private drug shop
Buying: 450
Urban private hospital
Buying: 360
Selling:
For-profit importer/ wholesalers
Margin
Buying: 365
Selling: 340.417
non-profit importer/ wholesalers
Margin: 13.607%
Buying: 260.4
Selling: 340
Tanzanian manufacturers
International wholesaler reference price 244.5

Figure 11: Chloramphenicol for injection : supply chain prices



Conclusion

The key findings in this paper are the following:

- As expected, out-of-pocket spending dominated purchase of medicines in rural areas; there was a worryingly high rate of purchase of part-doses of medicine particularly in the private sector (drug shops and privately owned facilities).

- Buyers in the poorest districts were significantly more likely to find the drugs they sought unavailable, and faced higher prices in drug shops – but not in FBO / NGO facilities – than those in the better-off districts.
- For medicines available in both drug shops and prescribing facilities, FBO/NGO facilities prices were not significantly different from shop prices; private prescribing facilities however charge significantly more than other outlets; furthermore list prices in the private sector were more likely to understate observed selling prices than in the FBO/NGO sector.
- The country source of essential medicines in rural Tanzania is primarily Tanzania, Kenya and India; the most widely available basic medicines, including paediatric suspensions, basic antibiotics and anti-malarials, and analgesics, were all widely stocked in Tanzanian as well as imported versions. Only the injectables, some chronic illness medicines and one antibiotic were solely available as imports.
- There were no significant differences between prices of medicines from the three main countries of origin, suggesting a competitive pricing process; data on price dispersion suggests strong price competition for common items, but much greater price variability for higher priced and less frequently purchased medicines.
- The non-governmental facilities in rural areas were able to buy at significantly lower prices than private facilities, benefiting from lower selling prices by non-profit and government wholesalers which were not accessible to private shops and facilities who buy from private wholesalers.
- Margins of selling over buying prices therefore tended to be lower for drug shops than for other outlets; average margins for medicines sold by all types of outlet were 136% for drug shops, 149% for private facilities and 169% for FBO/NGO facilities; margins are highly variable by medicine with cheaper medicines sold at higher margins.
- Mean wholesale margins, between wholesale buying prices and rural facilities' buying prices, vary between one third and 50% and not significantly different by sector; however the non-profit wholesalers add quite stable margins, while private wholesalers' margins vary very widely as availability and prices change.
- Tanzanian non-profit and governmental wholesalers appear to be buying efficiently when prices are compared to international reference prices.

These findings support strongly the importance of the non-profit as well as the government sector in sustaining medicines access in Tanzania. It is clear however that

its impact is limited by a number of factors, including shortages at the public wholesaler and also in the government facilities (URT 2006, 2007) and also the cost of medicines in a context dominated by out-of-pocket spending. We lack good data on the balance of public, non-profit and private supply in this market, and the extent of reliance on drug shops, but it clear that the competitive weight of the non-profit and government wholesalers is a force for keeping down prices while there is extensive reliance on rural drug shops for medicines access. Except for a few 'commodity' items – some widely bought tablets, for example – the retail markets appear not very price-competitive, and prices are very variable.

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End notes

[i] www.who.int accessed 1.05.08 and interview with Tanzania Food and Drug Authority (TFDA) official October 2006.
[ii] Source: interviews with medicines procurement experts at international organisations including WHO and other UN and multilateral agencies; see also IFC (2007).
[iii] The category 'private pharmacy' in Table 1 is presumed to include drug shops permitted to sell only a small range of medicines including anti-malarials, as well as pharmacies licensed to sell the full range of prescription medicines; see further below.
[iv] Calculated using recoded data for children downloaded with permission from the DHS site, May 2008.
[v] We are most grateful for the close collaboration and support of the Tanzania Food and Drug Authority (TFDA) in the selection of these medicines and more broadly in the design and conduct of the research.
[vi] Chi^2 Pr=0.07
[vii] Chi^2 Pr=0.012
[viii] Chi^2 Pr=0.006
[ix] Two tailed t-test with unequal variances on log transformed expenditure data, p=0.097
[x] Acyclovir, Amodiaquine (suspension), Amoxycillin (suspension), Ampicillin, Ciprofloxacin, Clotrimazole (cream), Diclofenac, Mebendazole, Metronidazole, Omeprazole, Paracetamol, Phenobarbitel, Praziquantel, Prednisolone, Promethazine, Quinine, Salbutamol, Sulphadoxine-Pyramethamine (SP); see Methodology section for detail by medicine.
[xi] The set in footnote 6, plus Atenolol, Ceftriaxone (injection), Chloramphenical (injection), Doxycillin, Erythromycin, Fluconazole, Frusemide, Gentamycin (injection), Sulpamethoxazole-Trimethoprim.
[xii] Robust mean (tri-mean) by district of robust means of price of each medicine stated by outlet manager, for set of 18 and 27 widely available medicines. The robust mean is calculated as:

(twice the median plus the two quartiles) divided by 4

This is a robust measure of the central tendency of small sample data (Tukey 1977).
[xiii] Albendazole (suspension), Amodiaquine (suspension), Clotrimazole (cream), Diclofenac, Mebendazole, Paracetamol, Phenobarbitel, Promethazine, Quinine, Salbutamol, SP.
[xiv] Pairwise signtest of Singida region against Kilimanjaro Region districts: drug shop prices of districts within the same region are not significantly different from each other; across regional boundaries the differences between median prices are significant at the 1% level.
[xv] The same set as in footnote 7, less Fluconazole (not available in all districts in NGO facilities), plus Ferrous Hydroxide and Folic Acid (syrup).
[xvi] Quotations unless otherwise stated are from project interviews.
[xvii] Sign tests of the difference between medians, prices in private dispensaries and health centres against prices in drug stores and against prices in FBO/NGO lower level facilities reject the null hypothesis of equal median prices (Probability of the observed number of positive differences Pr=0.0106 and Pr=0.0037).
[xviii] Sign tests of the difference between medians, prices in private dispensaries and health centres against prices in FBO/NGO lower level facilities and against prices in FBO hospitals reject the null hypothesis of equal median prices for 27 medicines (Probability of the observed number of positive differences Pr=0.0001 and 0.0047)
[xix] Albendazole (suspension), Amodiaquine (suspension), Amoxycillin (suspension), Ampicillin, Ciprofloxacin, Clotrimazole (cream), Diclofenac, Doxycillin, Mebendazole, Metronidazole, Paracetamol, Prednisolone, Quinine, Salbutamol, Sulphadoxine-Pyramethamine (SP).
[xx] Amodiaquine (suspension), Amoxycillin (suspension), Ciprofloxacin, Diclofenac, Mebendazole, Metronidazole, Paracetamol, Quinine, Sulphadoxine-Pyramethamine (SP).
[xxi] This widespread use is surprising since the medicine has well known dangerous side effects and is strongly restricted to prescription use in Europe.
[xxii] Two tailed t-test with unequal variances on log transformed expenditure data, p=0.000
[xxiii] See a separate paper by Sudip Chaudhuri for this project on Indian firms and the Tanzanian market.
[xxiv] For more evidence on this point, see a later section.
[xxv] Signtests show a scatter of positive and negative differences on each pairwise comparison, and no significant differences between medians.
[xxvi] For this concept see the working paper for this project by Mackintosh (2008)
[xxvii] Regression of robust mean margin on robust mean buying price, by medicine, all rural outlets. R^2=0.504 Both coefficient and constant significant at 1% level.
[xxviii] The margins in drug shops on medicines the shops are permitted to sell as not significantly different from margins on those not permitted; the inverse buying price/ margins relationship holds for both sets of medicines.
[xxix] Source: interview at MSD
[xxx] Signtest on 24 medicines bought by both, one sided test for lower non-profit median price p=0.032
[xxxi] Robust mean
[xxxii] Work is continuing to try to identify ways of using landed values for medicines for this purpose, in collaboration with the TFDA, and with relevant Indian price data..
[xxxiii] For further detail on competition among 'social' wholesalers and the choice of reference prices, see Mackintosh (2008)

[xxxiv] Not much weight should be placed on the urban price data, drawn from a very small number of cases used to test the questionnaires before the rural survey.