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First Author: Branko Milanovic

Corr. Author: Branko Milanovic

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## Qat Expenditures in Yemen and Djibouti: An Empirical Analysis

5 Branko Milanovic<sup>1</sup>  
World Bank and Carnegie Endowment for International  
Peace, Washington DC, USA **Q1**

10 *Using household surveys from Yemen and Djibouti, the paper analyses*  
*determinants of qat consumptions in two countries. The results confirm*  
*huge importance of qat in daily life: with between one-half (in Djibouti)*  
15 *and 70% (in Yemen) of all households reporting at least one user. But*  
*in Yemen, qat consumption is remarkably flat across income groups,*  
*age, and between rural and urban areas. Qat is a normal good and there*  
*is no indication that its use substitutes for food. In Djibouti, however,*  
*qat consumption increases with income, and appears to act as a substitute*  
20 *for food consumption. In both countries however there is a strong gender*  
*bias in the use: men are much more likely to use qat than women.*

**JEL classification:** D12, I12

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30 “When you chew qat, you are on the top of the planet,  
but after you spit it out, the planet is on the top of you”  
A Somali proverb

35 “We are young but we have no future. Qat lets us forget that”  
A Somali youth quoted in Stevenson (1992)

<sup>1</sup> Views expressed are my own and should not be attributed to the World Bank or its affiliated organisations. The research was financed by World Bank Research Grant PO72208 and Yemen Qat Trust Fund 024353.  
Corresponding author: Branko Milanovic, World Bank and Carnegie Endowment for International Peace, Washington DC, USA.

## 1. Introduction: The Case of Qat

Although addictions play a large role in the life of many communities, and by definition in the lives of the addicts, there is little systemic economic research of their effects. There are several reasons for this. Some addictions involve the use of illegal substances. They are, therefore, unlikely to be revealed to the interviewers, and while ultimately, when the addicts require medical help, the data on individual cases may be gathered, no large-scale survey data are likely to be available. This explains why relatively little work on economics of addiction and drug production and consumption exists in the literature. For example, an EconLit (economics reference software) search of 'drugs' and 'addiction', and 'alcohol' and 'addiction' turns up a combined total of 276 references, while a search of 'corruption' generates 2828 records, and 'AIDS' 1319 records.<sup>2</sup>

The work that does exist deals mostly with various forms of addiction in developed countries, and in particular the United States. Starting with the model of 'rational addiction', defined by Becker and Murphy (1988), there have been a number of studies. The Becker and Murphy model aims to explain an apparently irrational behaviour (addiction) by assuming that individuals are rational, welfare-maximising agents. The essential characteristic of an addictive good is that utility derived from its current consumption is a function of the stock of past consumption. It has generated empirical studies of tobacco consumption (Becker *et al.*, 1991), alcohol (Grossman *et al.*, 1998), cocaine (Grossman *et al.*, 1996; Fryer *et al.*, 2005), marijuana (Pacula, 1997). The alternative to the model of rational addiction questions the model's postulate of individual as a fully-informed rational decision-maker not driven by internal contradictions. Herrnstein's (1991) alternative model is grounded in behavioural psychology, where individuals' knowledge of the environment they face and the means to maximise welfare are imperfect. Instead of attempting to maximise welfare, they settle for 'meliorating strategies.' Going further from economics into psychology, there is a model by Ainslie (1986, 1991, 1993) where personality is decomposed into several 'motivational states' or personae. Individuals therefore behave differently depending into which motivational state they find themselves in.

<sup>2</sup> Search done on August 15, 2006.

80 Mochrie (1996) tries to combine Ainslie's view of individual as driven by different personae within himself with Becker and Murphy's theory of rational addiction.

Similar studies do not exist in poorer countries mostly because of lack of survey data; longitudinal surveys that are often needed are even less likely to be available. The exceptions are studies of tobacco use (for a review see Jha and Chaloupka, 2000; Chaloupka *et al.*, 2004). Dearth of work on addiction is in clear dis-  
85 proportion to how important different addictions are for the welfare of people, or even for the economies of many countries (Colombia, Venezuela, Yemen, Ethiopia).

90 This paper tries to fill parts of the gap by studying factors associated with qat consumption – based on 'one-shot' household surveys from Yemen and Djibouti. The economic data from these two countries have been scant in many areas, and even more so in the area of household consumption (which requires survey infor-  
95 mation). To my knowledge, this is the first time that such data (for Yemen and Djibouti) have been collected and analysed.<sup>3</sup> However, the data limitations are quite severe. The surveys, whose main objective was to estimate overall level and distribution of consumption—not to focus on qat—consider qat simply as one of the items  
100 consumed by households. Very little additional information is provided, including the fact that prices or unit values are unavailable. Some of the household characteristics, that may be regarded as possibly correlated with consumption of an addictive substance, are similarly absent. Finally, the two surveys' designs are different  
105 and the findings are not directly comparable (we return to this topic in Section 2). This is why the results should be regarded rather as two separate snap-shot pictures with elements in common than a true comparative study. The objective is not to test any of the models mentioned above (which often require panel data), nor to  
110 look at the taxation policy that may be used to discourage consumption of qat, but much more modestly, to present associations between various household characteristics and consumption of qat in Djibouti and Yemen.

115 Qat is a very popular hallucinogen. Qat is produced in the South of the Arabian Peninsula, mostly in Yemen, and East Africa

<sup>3</sup> Actually, the Djibouti 1997 survey used here is the first representative household survey ever conducted in Djibouti.

(Ethiopia and Somalia). "Qat is a 10–20-foot flowering evergreen shrub or small tree native to East Africa and Southern Arabia. The fresh young leaves of the *Catha Edulis* shrub have traditionally been consumed where the plant is cultivated, primarily in East Africa and the Arabian Peninsula. Chewed in moderation, qat alleviates fatigue and reduces appetite. Compulsive use may result in manic behaviour with grandiose delusions or in a paranoid type of illness, sometimes accompanied by hallucinations (Pantelis *et al.*, 1989). It contains a number of chemicals among which are two controlled substances, cathinone (Schedule I) and cathine (Schedule IV). As the leaves mature or dry, cathinone is converted to cathine, which significantly reduces its stimulatory properties. Cathinone is approximately 10 more times more potent than cathine and is only present in fresh leaves."<sup>4</sup>

Map below shows the area where qat is produced and consumed. The use of qat predates coffee, which was also originally from the same area, and qat is used in a similar social context. The qat consumption, however, generally takes longer than that of coffee, and sessions often extend for several hours. "Qat is used by the lowliest goatherd and loftiest government minister. It defines the rhythms of the day. Government offices close at 2 p.m., allowing plenty of time to chew .... (qat chewers) sprawl on cushions, puffing on water pipes or cigarettes and sipping from water bottles to combat the dehydration that is one of the qat's side effects. Conversation, which flows rapidly at the outset, wanes as the qat begins to take effect and the chewers approach 'Solomon's hour', an introspective time that is often accompanied by the playing of the oud. The typical session lasts from three to four hours, after which the chewer spit out his wad of qat-mulch and goes home" (Lancaster, 1997). "Qat chewing begins in the early afternoon and extends well into the night. After a good long chew, punctuated by gossip, locally bottled cola drinks and imported cigarettes, qat users can find themselves wide awake into the wee hours, and groggy when morning comes and duty calls" (Cross-Najafi, no date).

Qat's international status is ambiguous: in the United States, France, Sweden etc. it is considered a drug and is illegal, but is

<sup>4</sup> Quoted <http://www.streetdrugs.org/khat.htm>. Both cathinone and cathine are 'controlled' (not banned) under the United Nations Convention on Psychotropic Substances 1971.

160 not on the UN's 'Single convention of narcotic drugs' (even if both  
key chemicals contained in qat are 'controlled'). In some countries,  
like the UK, it is on the list of 'watched substances': its imports are  
free, but its consumption is 'watched' meaning that it is considered  
165 acceptable so long as it is consumed within the traditional foreign  
communities (e.g. Yemenis in the UK). In the Horn of Africa, qat  
is accepted, the way that alcohol, for example, is accepted in the  
West. Yet qat production and consumption statistics are either not  
included, or included only in part, in countries' national accounts.  
170 Because of the importance of qat production and consumption in  
Yemen, Ethiopia, and Somalia, this imparts a downward bias to  
their GDPs.<sup>5</sup> Moreover, qat often represents one of key exports  
(Figure 1).<sup>6</sup> Q2

### 1.1 Importance of Qat in Djibouti and Yemen

175 As Djibouti is not producer of qat, it imports qat from Yemen,  
Ethiopia and Somalia. It is estimated that imports from Ethiopia  
(through the sole authorised Djibouti importer Sofic) are approxi-  
mately 10 tons of qat daily.<sup>7</sup> The price of qat is set by an inter-  
governmental accord between Ethiopia and Djibouti. As of 1998,  
180 the ex-factory price was \$3 per kilo, which is <1/10th of the US  
street price: the latter ranges between \$30 and \$60 per kilo. There  
are also large imports from Yemen (about two planeloads by  
week). Total Djiboutian imports for domestic use (i.e. excluding  
large re-exports out of Djibouti) are about \$200 million annually.  
185 Thus qat imports account for about 1/10th of total country's  
imports.

190 Despite the obvious importance of qat consumption in several  
countries in the Horn of Africa, there are no empirical studies on  
its consumption: who are the consumers, how much they spend  
on it, how consumption of qat is related to income of households  
etc. These lacunae can now begin to be filled thanks to the existence

<sup>5</sup> The World Bank 2001 estimate for Yemen was that qat production amounts to up to a quarter of registered GDP and 16% of employment (Ward, 2000, p. 19; World Bank, 2001, p. 7). Qat is grown on >50% of cash-crop agricultural land (World Bank Yemen Office, 2001, p. 6).

<sup>6</sup> In Ethiopia, recorded qat exports account for 12–14% of all exports (International Monetary Fund, 2000, p. 53).

<sup>7</sup> 'Qat commerce in Ethiopia is booming' from <http://www.telecom.net.et/~usis-eth/wwwhekha.htm>.

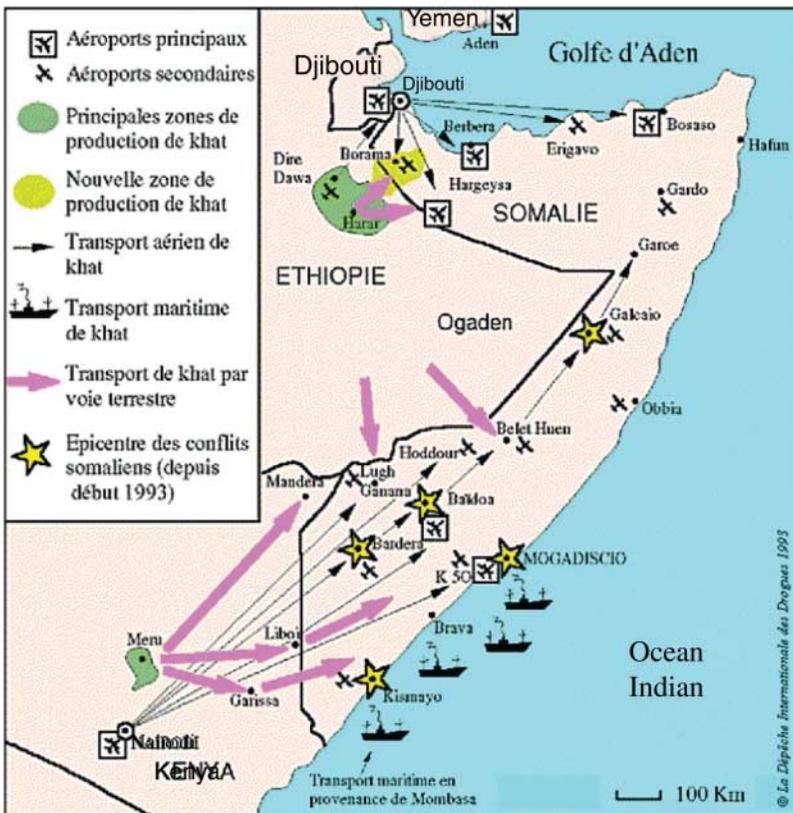


Figure 1: Production and Distribution of Qat in the Horn of Africa (Source: <http://www.ogd.org/fr/21ASORLA.html>.)

of two recent household surveys conducted in Yemen and Djibouti. The organisation of the paper is as follows. Section 2 reviews the data base – household budget surveys conducted in Yemen in 1998 and Djibouti in 1997. Section 3 provides a profile of qat users in the two countries. Section 4 focuses on the distribution of qat expenditures and income. Section 5 derives demand functions for qat consumption, and looks at the substitution between qat and food consumption. Section 6 presents the conclusions.

235 **2. Data Sources**

There are two detailed sources of data for our analysis: Yemen household survey conducted in 1998, and the Djibouti household budget survey conducted between February and July 1997. In both cases, we have access to micro data, although in the case of Yemen, we have access to only a limited number of questions, and the accompanying documentation (including the questionnaire) is very weak. While the Djibouti survey is more detailed so far as qat-related questions and nutritional and schooling information are concerned, the Yemeni survey covers more extensively household characteristics, incomes and expenditures. This unbalance in surveys' coverage has necessitated that some issues be discussed for one country only. However, special effort was made to focus on the issues that are common to both and thus to gain additional insight – although a number of caveats regarding comparability exist.

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The Yemeni household survey includes 13,641 households or 97,544 individuals (the average household size is 7.15). This represents about 0.6% of the country's population. The survey is nationally representative. Households are interviewed over the period of four weeks during which they report their expenditures and income. However, as already mentioned, on the issue of qat consumption the survey is not very extensive. There is only one question on the value of household monthly qat purchases. Money expenditures on qat represent 5.7 of total money food expenditures (or 5.2% of all food: purchased, own consumed, or received as gift). There is no information however on qat that may be produced and consumed at home nor on qat received as gift. There is thus underestimation of true qat consumption. The underestimation may be significant. An idea how large the underestimation may be is provided by the share of purchased in total food consumption which is 91%.<sup>8</sup> Another serious source of underestimation (both in Yemen and Djibouti) may be the reluctance of those who are interviewed to provide information about qat use or to intentionally claim lower consumption.

In Djibouti Household Income Survey (*Enquête Djiboutienne auprès des menages*, EDAM), conducted by the Djibouti Bureau of

<sup>8</sup> The questions on food ask for (i) total amount spent on food, (ii) estimated value of home-produced food, and (iii) estimated value of food received as gift. Only the first question is asked for qat.

Statistics between February and July 1997, we have a truly unique  
source of information on the use of qat. The survey is nationally  
representative of the sedentary population of Djibouti, and includes  
2,380 households from rural areas, urban areas outside the capital,  
and the capital. There are in total 15,701 individuals (average  
household size 6.6), which is almost 2½% of the total population  
of Djibouti.<sup>9</sup> The data are available at the household and individual  
level. The survey questionnaire contains information typical for pri-  
ority surveys. It includes data on expenditures by ten expenditure  
categories, sources of income, and quite a lot of data on school  
attendance, housing conditions, visits to doctors. Several attitudinal  
questions were asked as well: household members were asked to  
assess how satisfied they are with education, health system, house-  
hold amenities etc. As for the qat consumption, respondents were  
asked how many qat users there are in their household, what is  
their sex, and how much they consume.<sup>10</sup> Individual qat users  
are not identified however. Food consumption variable does not  
include qat consumption.

There are several differences in the set-up of the surveys that  
(even if everything else were the same) impose sharp limits to  
direct comparisons of Yemeni and Djibouti results. The first is the  
difference between purchased (Yemen) and consumed qat  
(Djibouti). The latter will be, generally, greater because it includes  
self-produced qat and gifts received, although it would exclude  
qat that might have been purchased for later use or given as gift.  
Second, the consumption reference period in Djibouti is only one  
week while it is a month in the case of Yemen. In principle,  
shorter reference period leads to estimates of higher inequality  
(Gibson *et al.*, 2001) and, in some case, also higher mean (Deaton,  
1997, pp. 24–6). Higher inequality stems from many recorded  
zero consumptions; higher average occurs because people, when  
asked about consumption over a longer time-period, fail to recall  
all of it.<sup>11</sup> Third, in Yemen, household head is supposed to keep  
track of qat purchases, and in Djibouti, individuals were asked

<sup>9</sup> The population of Djibouti is estimated at between 550,000 and 600,000 persons.  
The uncertainty is due to a significant number of nomads in the East.

<sup>10</sup> More exactly, the interviewee is asked to give the number of boxes of different  
values (100 Francs, 300 Francs, etc.) consumed over the period of one week.

<sup>11</sup> Of course, calculated over the same time period. Thus a weekly consumption  
will be multiplied by 4.3 to obtain a corresponding monthly consumption.

315 for their own consumption although in practice it does not seem to  
have been followed and household heads gave their estimates of  
members' consumption. While the difference in the third element  
seems minor, the first two will tend to bias both mean consumption  
and inequality down in the case of Yemen (compared with  
Djibouti). This point needs to be kept in mind in the rest of the  
analysis.

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### 3. Who Are the Users of Qat in Yemen and Djibouti?

325 Table 1 gives the share of households with the presence of qat users  
by welfare decile. In both cases, the welfare level is determined by  
dividing total household expenditures by the number of equivalent  
adults units. The exact formula of welfare of each household  
member is

$$330 \quad \text{Individual welfare} = \frac{\text{Household expenditure}}{(\text{household size})^\theta},$$

where the economies of scale parameter ( $\theta$ ) is taken to be equal to  
0.75. The  $\theta = 0.75$  parameter is the scale used in the World Bank  
Djibouti Poverty Assessment (World Bank, 1997), and is thought  
335 appropriate for large households (six to seven members) which  
is, as we have seen, characteristic of both Yemen and Djibouti. We  
use expenditure as the welfare indicator in preference to income  
because the former is considered a better indicator of household  
actual welfare, and because underreporting is less of a problem  
340 with expenditures than with income. However, for simplicity the  
terms welfare level (which would be strictly speaking appropriate  
because we deal with expenditures) and income level will be  
used interchangeably.

345 Table 1 shows that in Djibouti, there is a clear trend of increase in  
the number of qat users with income. While among the bottom  
decile, only 7% of households report spending anything on qat,  
the percentage rises to more than three-quarters among the  
richest households. In Yemen, however, there is less variability in  
the incidence of use by welfare level. Although the share of users  
350 goes up with welfare, it never falls below 62%, and never exceeds  
81%. On average, 50% of households in Djibouti, and almost 70%  
in Yemen report using qat. The high registered incidence in

Table 1: *Food Shares and Incidence of Households with the Presence of Qat Users by Welfare Decile*

Welfare decile (according to expenditures per equivalent adult)	Yemen		Djibouti		
	Food share in total expenditures	Incidence of qat users	Food share in total expenditures	Incidence of qat users	
First (poorest)	0.69	0.62	0.65	0.07	
Second	0.54	0.64	0.58	0.29	
Third	0.43	0.63	0.51	0.34	
Fourth	0.35	0.66	0.48	0.42	
Fifth	0.30	0.69	0.46	0.52	365
Sixth	0.26	0.68	0.42	0.57	
Seventh	0.24	0.70	0.41	0.64	
Eighth	0.21	0.74	0.39	0.70	
Ninth	0.18	0.76	0.35	0.75	
Tenth (richest)	0.17	0.81	0.28	0.71	370
<i>Average share</i>	0.26	0.69	0.46	0.50	

*Note:* Expenditure per equivalent adult are defined as: total expenditures divided by (household size) 0.75.

Yemen is still somewhat of an estimate because of likely existence of households that use only self-produced qat. Clearly, we are dealing, in both countries, with a major social phenomenon affecting lives of most of the population. The table also shows the food shares across deciles. They range from 65 to 69% for the poorest decile in both countries, to 28% for the richest decile in Djibouti and only 17% for the richest decile in Yemen. With the exception of the poorest decile, food shares are always higher in Djibouti than in Yemen (for a given decile) implying that, at a given decile level, people are likely to be better off in Yemen than in Djibouti. This is confirmed by looking at mean expenditures in dollar terms: they amounted to \$2,558 per capita annually in Yemen and \$1,230 in Djibouti. In \$PPP terms, Yemeni mean per capita expenditures are twice their US dollar amount (that is, they are a bit over \$5,000 per year). Consumption PPPs for Djibouti are not available. Yet the price level is unlikely to be lower than in Yemen and a

significant real difference, to the order of 2-1 in favour of Yemen, is likely to persist.

395 Table 2 makes clear that there is very little difference in the incidence of qat use between rural and urban areas of Yemen. The habit seems to be almost equally prevalent and to be only mildly increasing with income level in both areas. The most frequent users are rich urban and rural households with the incidence of about 80%.

400 Does use vary with the size and type of household? Table 3 shows that the incidence of use increases with household size. This is expected because with a larger household size, there are clearly more potential users. It is, however, striking that the percentage of users among single-person households in Djibouti is quite small (30%). Such households represent only 2.8% of all households and their importance is therefore limited.

405 The gender differences are substantial. In Yemen, almost three-quarters of male-headed households (which represent 92% of all households) report some spending on qat. Less than a third of female-headed households do the same. It is not inconceivable, moreover, that the gender differences are even larger because the actual users in female-headed households could be men (e.g.,  
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Table 2: *Incidence of Qat Users in Households in Rural and Urban Yemen*

415	Deciles (according to expenditures per equivalent adult in each area)	Urban	Rural
	First (poorest)	0.63	0.62
420	Second	0.63	0.64
	Third	0.59	0.65
	Fourth	0.62	0.66
	Fifth	0.65	0.70
	Sixth	0.69	0.65
	Seventh	0.69	0.73
425	Eighth	0.69	0.75
	Ninth	0.74	0.77
	Tenth (richest)	0.78	0.84
	<i>Average share</i>	0.67	0.70

*Note:* Equivalent adults calculated using economies of scale parameter 0.75.

Table 3: Incidence of Use By Family Size and Gender

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Household size	Yemen	Djibouti	
1	0.38	0.30	435
2	0.60	0.40	
3	0.62	0.40	
4	0.68	0.42	
5	0.69	0.46	
6	0.67	0.49	440
7	0.71	0.43	
8	0.72	0.53	
9	0.72	0.61	
10 +	0.73	0.67	
Among all males		0.26	
Among all females		0.02	445
Male-headed households	0.72		
Female-headed households	0.30		

Note: In the Yemen survey, we have no information on the sex of individuals, but only of household heads.

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sons). The Djibouti data, where we can better distinguish the sex of users, show gender difference to be substantial. More than a quarter of all males are *khateurs*, and only 2% of all women.<sup>12</sup>

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Table 4 shows the number of male qat users per household (for Djibouti only). There are almost 20% of households with more than one male qat user per household.

The incidence of qat use increases with age and around 40 years of age begins to flatten out. However, the results shown in Figure 2, which refers to Yemen, are based on the age of *household head*. In other words, we are bound to underestimate qat use among young males who live with their parents. One can conjuncture that, if we had data on actual users, the incidence curve in Figure 2 would be flatter. Thus, both the incidence by age, and the incidence by income class, seems high and fairly flat in Yemen.

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<sup>12</sup> 'Khateur' is a French term, used in Djibouti, for a qat-chewer.

Table 4: *Djibouti – Number of Male Qat Users by Household*

	Number of qat user by household	Percentage of households
470		
	0	43.4
475	1	40.3
	2	8.8
	3	4.0
	4	1.8
	5	0.8
480	6	0.1
	>6	0.9

#### 4. Distribution of Welfare and Qat Expenditures

485 The distribution of welfare (proxied by expenditures), and the distribution of qat use and qat expenditures in Yemen and Djibouti display different patterns. Distribution of welfare is much more unequal in Yemen than in Djibouti: the Gini coefficient of expenditures per equivalent adult (using the same scale with  $\theta = 0.75$ ) is 52.3 in Yemen, and only 37.4 in Djibouti.

490 We have already noticed that in Yemen the incidence of qat use varies but little with income. Therefore the concentration coefficient of qat use is very low: between 3 and 4 points (Table 5).<sup>13</sup> It is not significantly different from the value of 0, which indicates an equal incidence across all income groups. In Djibouti, the situation is markedly different. The incidence of use is more equal than the distribution of income, but is still, in absolute terms, pro-rich (the concentration coefficient of 20).

495 People with higher income are not only more likely to consume qat, they also consume more of it. Thus the concentration coefficients of qat expenditures are much greater than the concentration coefficient of qat use. It is, as shown in Table 5, 26.4 in Yemen and a

500  
505 <sup>13</sup> The concentration coefficient describes inequality with which a variable (say, use of qat or expenditures on qat) is distributed when recipients are ranked, from the lowest to the highest, according to another variable (say, their household per capita welfare). The Gini coefficient is a special case of the concentration coefficient when both variables (the ranking criterion one, and the one into whose distribution we are interested) are the same.

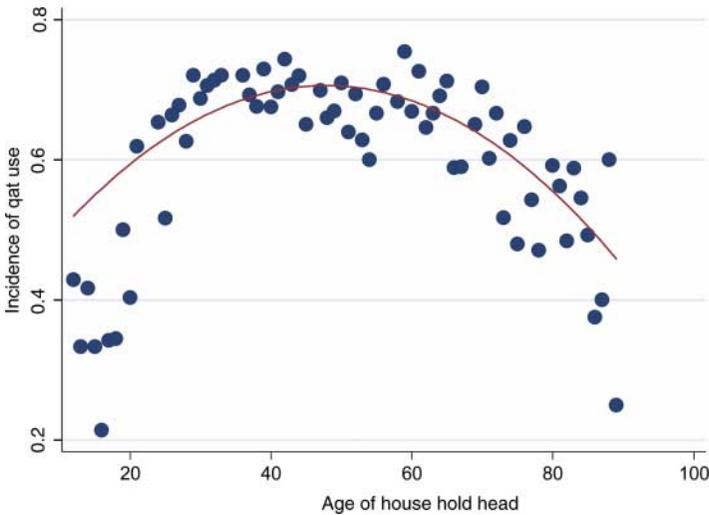


Figure 2: *Incidence of Qat Use by Age of Household Head (Yemen) [Source: Yemen household survey 1998]*

very high 47.3 in Djibouti (on an equivalent adult basis). The concentration curves for qat expenditures are shown in Figure 3. The fact that the concentration curve for Djibouti lies outside the Lorenz curve implies, on average, greater than unitary income elasticity of qat expenditures; the reverse is true for Yemen where the qat concentration curve lies inside the Lorenz curve implying an average income elasticity between 0 and 1 (Yitzhaki and Slemrod 1991; Yitzhaki and Lewis, 1996).<sup>14</sup> It is another way of saying that qat in Djibouti is a luxury while in Yemen it is a normal good.

In conclusion, the main difference in qat consumption between the two countries is that in Yemen, compared with Djibouti, consumption is more widely spread, is less sensitive to income level, and is much more equally distributed than income. In Djibouti, in contrast, qat expenditures are more unequally distributed than income.

<sup>14</sup> A tax rate applied to a good whose concentration curve lies below the Lorenz curve will be, on an average, progressive. This feature was used by Yitzhaki and Lewis (1996) to derive in a multi-commodity framework the rules of taxation and subsidisation (or differently, rules for increasing and lowering the existing tax rates) such that the result would be Dalton-improving (that is, the outcome will be such that incomes of poorer individuals increase by at least as much as incomes of richer individuals decrease).

Table 5: *Inequality of Welfare Distribution and Qat Consumption*

	Yemen			Djibouti
	All	Urban	Rural	
Gini or concentration coefficient				
Gini of expenditures per equivalent adult (XPEA)	52.3	51.5	51.8	37.4
Concentration coefficient of qat use (ranking according to XPEA)	3.9	3.6	4.4	20.3
Concentration of qat expenditures per equivalent adult (ranking according to XPEA)	26.4	21.3	27.3	47.3

560 **5. Demand Functions for Qat**

The simplest demand functions for qat consumption across households (*i*'s) can be written as

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$$Q_i = \beta_0 + \beta_1 Y_{i*} + \beta_2 H_i + \sum_j \gamma_j Z_{ji} + e_i, \quad (1)$$

570 where  $Q_i$  is the household qat consumption (in logs),  $Y_{i*}$  the 'true' welfare indicator of household (also in logs),  $H_i$  the number of household members and  $Z_j$  are other variables of interest (e.g. education of household head, sex of household head, etc). We approximate 'true' household welfare by expenditures per equivalent adult using, as before,  $\theta = 0.75$  for both Yemen and Djibouti.

575 The question is what is the most appropriate way to estimate the regression. Qat, despite its widespread use and tolerance, is not an essential food item. It is therefore sensible to model the decision to use qat as a two-step process where people, based on some characteristics, first select to consume (or not), and then, in the second step, decide how much to consume (subject, of course, to having decided to consume at all). This approach makes sense particularly since we are interested in what are the correlates of consumption, once the decision to consume is taken. The system is estimated using Cragg (1971) two-hurdle model (used in a similar context elsewhere, see, e.g. Ferrelly *et al.*, 2002; or Ground and Koch 2007)

585 where the first, participation, regression deals with the decision to consume qat, and the second with determinants of consumption,

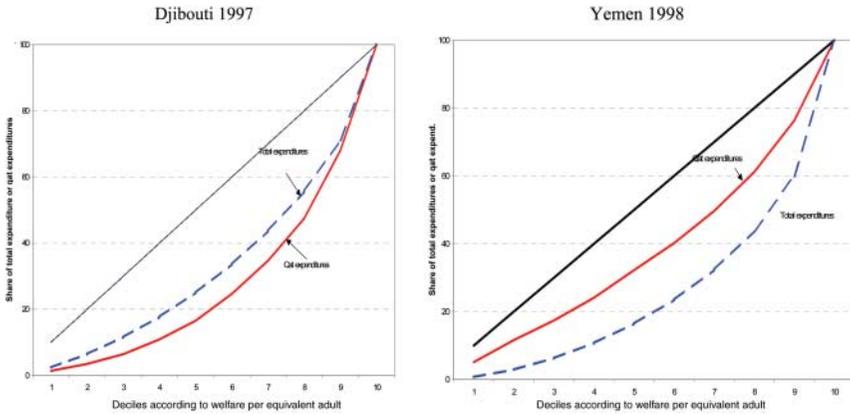


Figure 3: *Lorenz Curve and Concentration Curve of Qat Expenditures*

once a positive decision to consume qat is made. The first regression is a probit; the second is a truncated regression.<sup>15</sup> The same explanatory variables are used in both equations.<sup>16</sup>

The results are shown in Table 6. First, note that, as expected, income elasticity of both qat use and qat consumption is much greater in Djibouti than in Yemen (for consumption, 0.83 vs. 0.25). The former value, however, is less than implied by the concentration curve (Figure 3). The difference is due to the fact that the regression is run only among households that decide to participate (to use qat) while the concentration curve covers all households. The poor people, as we have seen before (Table 1), are much more likely to abstain from qat use altogether and hence across all population qat does acquire some features of a luxury (superior) good, which it lacks among consumers only.

Each additional household member increases qat expenditures by about 6–7% in both Yemen and Djibouti (statistically significant at <1% level). Male household head (as opposed to female) is

<sup>15</sup> Craig (1971) approach is a special case of the double-hurdle model, in the sense that the error terms of two regressions are assumed to be independent.

<sup>16</sup> The advantage of the two-hurdle model compared with Heckman's selection model is flexibility of its functional form. For a recent discussion of advantages and disadvantages of the two approaches, particularly in the context of decisions to consume addictive substances (Madden, 2006). The regressions for Djibouti and Yemen have also been estimated by the Heckman's selection procedure and the results (available from the author on request) are very similar to those shown here.

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Table 6: Explaining Qat Participation and Consumption

	Yemen		Djibouti	
	Participation	Consumption	Participation	Consumption
In of expenditures per equivalent adult (=welfare level)	0.085* (0)	0.250** (0)	0.544** (0)	0.835** (0)
Household size	0.015** (0)	0.060** (0)	0.003 (0.88)	0.074** (0)
Age of household head	0.0002 (0.97)	0.013** (0)		
Age squared ( $\times 100$ )	-0.0001 (0.13)	-0.0001** (0)		
Urban	0.083* (0.03)	0.335** (0)		
Male household head	0.886** (0)	0.379** (0)	3.922** (0)	0.205** (0)
Educ2 (reads and writes)	-0.057 (0.08)	0.160** (0)		
Educ3 (primary)	-0.312** (0)	0.083 (0.12)		
Educ4 (unified primary)	-0.911** (0)	-0.133 (0.34)		
Educ5 (preparatory)	-0.267** (0)	0.133* (0.01)		
Educ6 (pre-secondary)	-0.238* (0.03)	0.274** (0)		
Educ7 (secondary)	-0.244** (0)	0.293** (0)		
Educ8 (post-secondary)	-0.261** (0)	0.138 (0.06)		
Educ9 (academic)	-0.143** (0)	0.382** (0)		
Empst2 (self-employment)	0.168** (0)	0.282** (0)		
Empst3 (employer)	0.123 (0.09)	0.582** (0)		
Empst4 (household worker with no pay)	-0.143 (0.47)	0.024 (0.91)		
Empst5 (working for others; no pay)	0.182 (0.79)	0.782 (0.15)		
Constant	-1.130** (0)	3.742** (0)	-8.583** (0)	0.825 (0.10)

(continued on next page)

Table 6: (continued)

	Yemen		Djibouti	
	Participation	Consumption	Participation	Consumption
Wald Chi-squared		1993** (0)		621** (0)
Number of observations (households)	11,370	8,087	2,380	1,151

*Note:* Dependent variable in the second regressions is natural log of qat expenditures. Yemen: The omitted category is illiterate (for education), and wage-workers (for employment status). *P*-values in brackets. Two-hurdle model: participation regression is probit; consumption regression is truncated regression.

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705 associated with both large increases in participation, and once the decision to participate is made, in expenditures. The latter range between 20% (in Djibouti) and 38% (in Yemen). Clearly, households headed by women are, as we have observed before, much less qat-dependent.

710 Due to a richer data basis available in the Yemeni survey, we can include other variables in the regression for Yemen. Age of the household head has a predictable inverted U-shape in consumption but not in the decision to participate. Urban households in Yemen are more likely to chew qat, and they spend on an average one-third more on qat than rural households. This may be due to the omission of data on qat consumption from own production (which is bound to be much more important in rural areas) since the incidence of qat use between urban and rural areas is practically the same (Table 2).

715 As for the education level of household head, more education is associated with lower participation almost throughout, but once the decision to chew qat is made, higher education is associated with greater expenditures (holding all other factors, including income, constant). Compare for example, people with academic education with illiterate household heads (who account for 42.5% of household heads in Yemen). The odds ratio for the more educated households is 14% less than for illiterate household heads, but spending is 38% higher. Education thus exerts an ambivalent role.

720 The self-employed and employer household heads tend to participate and spend more on qat than wage-workers (the omitted category).<sup>17</sup> Their spending is between almost 30 and 60% greater than that of wage-workers (holding, of course, everything else, including income, constant). We conjecture that this may be because these two categories of people are socially more prominent than wage-workers. Employment status might proxy for some characteristics, which are not included in the welfare variable. This may be household wealth or household social status that might oblige it to host qat sessions more often. Participating in qat sessions may be also more important for the self-employed and employers in order to establish business contacts or garner 'good-will.' A picture that thus emerges is not only of a good that is income-elastic but also 'social position elastic', *viz.*, whose consumption is associated

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<sup>17</sup> The difference in participation is statistically significant only at the 7% level for employer households though.

with a higher socio-economic status, and possibly desire to show it off by entertaining more.

A question often asked is whether there may be substitution between food and qat consumption. The reasons lie not only in the fact that greater consumption of qat reduces the amount of money households can spend on food but also that the reduction does not affect all household members the same; namely, fathers who are the main users of qat may deprive their young children of food (through lack of money). Another channel may run through the already mentioned fact that qat acts as an appetite suppressant. It may reduce consumption of food with all the attendant negative effects on the ability to concentrate and work. Indeed it is one of the most commonly alleged problems with qat: that it leads to underconsumption of food and lethargy among its users.

Table 7 tries to estimate whether there is substitution between presence of qat users and food consumption. We do this using several formulations. In formulation (1) for Yemen, we look at the household use of qat (regardless of the amount). We find no evidence that incidence of qat use is negatively related to food consumption. On the contrary, we find a complementary relationship: compared with the households without qat users, the ones with qat users spend some 17% more on food consumption (after controlling for household size and income level of household). All the other variables have the expected sign. Similar results are obtained (see regression 2 in Table 7) if we replace the binary variable indicating the presence of qat users by consumption of qat: each percent increase in qat consumption raises other food consumption by 3.2%. For Djibouti, on the contrary, we find the evidence of a substitution effect: presence of qat users reduces food consumption (everything else being the same) by 8.7%, and each additional percent of spending on qat reduces food consumption by 0.8% (see regressions 3 and 4 in Table 7). Perhaps, this is because the income level in Djibouti is lower at almost any percentile of income distribution. Under such exiguous circumstances, increased spending on anything (including qat) might translate into cuts in food consumption. In other words, the margin left for 'discretionary' spending (including food) is very narrow. However, we need to stress, as before, that one needs to be very cautious with comparative results since the survey designs are

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Table 7: *Substitution Between Expenditures on Food and Qat [Dependent Variable = ln(Household Food Consumption)]*

	Yemen		Djibouti	
	(1)	(2)	(3)	(4)
ln of expenditures per equivalent adult (=welfare level)	0.149** (0.01)	0.141** (0)	0.653** (0)	0.659* (0)
Household size	0.087** (0)	0.085** (0)	0.108** (0)	0.108** (0)
Age of household head	0.020** (0)	0.019** (0)		
Age squared (x100)	-0.0002** (0)	-0.0001** (0)		
Urban	0.076** (0)	0.066** (0)		
Male household head	0.033 (0.40)	0.003 (0.07)		
Educ2 (reads and writes)	0.274** (0)	0.271** (0)		
Educ3 (primary)	0.273** (0)	0.280** (0)		
Educ4 (unified primary)	0.294** (0)	0.322** (0)		
Educ5 (preparatory)	0.406** (0)	0.411** (0)		
Educ6 (pre-secondary)	0.455** (0)	0.455** (0)		
Educ7 (secondary)	0.541** (0)	0.541** (0)		
Educ8 (post-secondary)	0.547* (0)	0.552** (0)		
Educ9 (academic)	0.801** (0)	0.797** (0)		
Empst2 (self-employment)	0.164** (0)	0.152** (0)		
Empst3 (employer)	0.486** (0)	0.468** (0)		
Empst4 (household worker with no pay)	0.312** (0)	0.313** (0.002)		
Empst5 (working for others; no pay)	0.189 (0.58)	0.162 (0.63)		
ln(household qat consumption)		0.032** (0)		-0.008** (0)

*(continued on next page)*

Table 7: (continued)

	Yemen		Djibouti	
	(1)	(2)	(3)	(4)
Qat incidence (0-1)	0.167** (0.01)		-0.087** (0)	
Constant	7.234** (0)	7.317** (0)	4.086 (0)	4.008 (0)
F-value	262.5 (0)	277.0 (0)	1613.33 (0)	1621.46 (0)
Adjusted R-square	0.31	0.32	0.68	0.68
Number of observations (households)	11,370	11,370	2,253	2,253

Note: Yemen – The omitted category is illiterate (for education), and wage-workers (for employment status). Qat incidence takes value of 1 if there is any positive qat consumption. P-values in brackets.

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860 different, and so is the number of household characteristics that we  
can use as controls.

## 6. Conclusions

865 We have analysed the results of two household surveys, for Yemen  
and Djibouti, that both ask households questions related to qat use.  
Qat is widely consumed in both countries (although it is produced  
only in Yemen) with between 50% (in Djibouti) and almost 70% in  
Yemen reporting at least one qat user per household. This is fully  
870 consistent with anecdotic evidence regarding the huge importance  
of qat in daily life in both countries. Income elasticity of qat expen-  
ditures (once decision to use qat is made) is positive in both  
countries although significantly higher in Djibouti. Men or men-  
headed households use it much more than females or female-  
headed households. Both decisions to participate in qat use and  
875 how much to spend on it are statistically significantly greater for  
men-headed households.

Important differences between the two countries emerge when  
we move to a more detailed analysis. In Yemen, qat incidence  
does not vary much with income or age nor does it vary between  
880 rural and urban population. We also find no evidence that in  
Yemen qat consumption depresses consumption of food. The  
effect of education, that could be examined in Yemen, only is  
ambivalent: more educated household tend to participate in qat  
use less than household whose heads are illiterate, but once they  
885 do participate, they spend (controlling for income) more on it.  
The situation in Djibouti is different. Income elasticity of qat use  
is much greater. Indeed qat is more expensive in Djibouti than in  
Yemen (due to transportation costs) and Djibouti is a poorer  
country than Yemen with many poor people who apparently  
890 cannot afford it. Unlike in Yemen, we find that in Djibouti qat  
and food consumption appear to be (mild) substitutes.

The implication of these results, preliminary as they are, is that  
the use qat is much more widespread and part of social intercourse  
among all classes and ages in Yemen than in Djibouti. Perhaps  
895 because Djibouti is poorer and qat more expensive, it does not  
seem to have acquired the importance that it has in Yemen.  
Although our data do not allow us to test any of the different the-  
ories of addiction, the findings as well as the reading of the

literature on qat in Yemen, suggest that the use of qat cannot be fully understood as an individual decision to use an addictive substance. If the 'drug' has so much impregnated society and become part of social relations, refusing to take qat is tantamount to accepting ostracisation. This is because social life is organised around qat seances. Thus, the decision not to use qat is not equivalent to the decision to decline drinks at a dinner party; it is much more important because it excludes the person from many social contacts that are necessary for his business or private life, The decision whether one wants to take qat at first, and later continue its use, becomes indissolubly linked with other decisions about one's way of life. This is also why all action on reducing its use is so difficult.

It is important to underline that because of data limitations and differences in the survey designs, the analysis should rather be seen as a side-by-side picture of characteristics and factors associated with qat use in Djibouti and Yemen rather than a straight comparison between the two. The differences between the two countries clearly need to be investigated further. One may hope that further analytic work may not only help better inform policies of the two governments but make them also more willing to collect and share information with researchers both at home and internationally.

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