The Pakistan Development Review
34 : 4 Part II (Winter 1995) pp. 809—829

The Determinants of Rates of Octroi Tax in Pakistan

A. F. AISHA GHAUS, RAUF KHAN, and RAFIA GHAUS

Octroi is a tax imposed by local governments in Pakistan on commodities imported into the municipal limits for local use, sale, or consumption. It is levied generally by urban local councils on goods coming in by all modes—sea, land, and air transport. The point of assessment is alongside roads at octroi posts situated at or before municipal boundaries, at railway stations, seaports or airports.

Octroi is currently the largest source of revenue to urban local councils in the country and contributes 86 percent to total tax revenues and over 59 percent to total local revenue receipts (see Table 1). Its revenue significance (in terms of share in total receipts) has increased over the years. In 1987-88, it accounted for about 57 percent of total local receipts. Also, revenue generation from octroi is higher than that by any provincial tax. In 1991-92, total national collection from octroi was Rs 5.5 billion as compared to Rs 3.5 billion from stamp duties, the largest provincial tax source.

Table 1

Revenue Significance of Octroi
(For all Urban Local Councils Combined)

Year	Octroi Revenue (Rs in Million)	Share in Total Revenue (%)
1987-88	2892	57.2
1988-89	3185	57.4
1989-90	3906	58.5
1990-91	4659	59.0
1991-92	5466	59.6

Source: National Centre for Rural Development Data Base.

A. F. Aisha Ghaus is Research Economist at the Applied Economics Research Centre, University of Karachi. Rauf Khan and Rafia Ghaus are both Economist at Social Policy and Development Centre, Karachi.

Authors' Note: The authors acknowledge the comments of Prof. Dr Hafiz A. Pasha and the research assistance of Ms Naveed Hanif. Any defects that remain are, however, the responsibility of the authors.

Despite its obvious revenue importance, octroi remains a controversial tax, and has been subjected to a series of criticisms. Important among these are that it is regressive in its income distributive effects, inelastic, and inefficient [Karachi Master Plan (1974)]. Some work has been done to show that the former two may, to some extent, be valid. Pasha *et al.* (1988) and Iqbal (1986) suggest that the incidence of octroi collected from land posts tends towards regressivity. Similarly, Pasha *et al.* (1988), Iqbal (1986) and Ghaus and Pasha (1989) show that this component of octroi has limited revenue elasticity. No formal analysis has, however, been undertaken to establish the efficiency of the tax. The objective of this paper is to see whether octroi is an efficient tax in Pakistan through its adherence to certain principles of optimal commodity taxation. This involves an analysis of the determinant of octroi rates in Pakistan.

The paper is organised as follows: Section 1 briefly describes the tax as administered in Pakistan. Section 2 discusses the existing octroi rates. Section 3 presents the theoretical framework of the analysis; while in Section 4, the results of econometric analysis of the determinants of octroi rates are presented. Finally, a summary of conclusions is presented in Section 5.

1. DESCRIPTION OF OCTROI

Octroi is assessed on consignments entering by road and rail transport on the basis of weight in terms of 100 kilogram units. Flat rates of octroi are imposed and these rates vary between commodities. However, in the case of sea consignments destined for consumption within the city of Karachi, and an *advalorem* system of assessment of octroi with respect to the value of consignment has been in operation since 1972-73.

The largest contribution to octroi revenues is by food items. It ranges from 62 percent of total octroi revenues in the case of town committees to 18 percent in Metropolitan Corporations. In general, octroi in the bigger cities appears to be more broad-based. The dependence of octroi revenues on basic commodities like foods, textiles, drugs, medicines, building material, etc., particularly in the smaller cities, implies that the incidence of this component of octroi is likely to be regressive in character. Also, buoyancy of revenues may be low because of the relatively slow growth in the demand of basic items like food, clothing, etc. Therefore, it seems that part of the problem of regressivity and inelasticity in the tax arises due to the composition of its tax base.

Municipal Governments have, in general, handed over octroi collection to private contractors. Auctioning of octroi collection to private contractors was introduced in the 1970s and had led to substantial revenue gains to local councils due to stricter supervision of octroi collection.

2. EXISTING OCTROI RATES

The presence of a specific rate octroi structure implies that in the absence of discretionary changes in tax rates, revenues respond only to changes in quantities and not to a rise in prices of goods imported into municipal limits. Local governments have, therefore, attempted to preserve the growth of revenues by periodically escalating rates to, at least partially, re-establish the link with prices. However, the strategy has been small, across-the-board rate escalations. The consequence is that octroi rates are very low as compared to the price of commodities, and there appears to be a certain degree of *ad-hocism* in the structure.

Table 2 presents the average effective octroi rates [EOR] for a sample of twenty-three cities in Pakistan for 89 commodities, which account for the bulk of octroi revenues. EOR is defined as the specific rate as percentage of the price. The table shows that EORs are very low, at about 0.3 percent, of the wholesale consumer prices. A large proportion of items, about 37 percent, in the octroi schedule have EORs of less than 0.3 percent. 38 percent of the commodities have rates between 0.31 and 0.5 percent while only about one-fourth of the commodities have rate equivalent to more than 0.5 percent of the price.

Table 2

Effective Octroi Rate in Pakistan***

Effective Rate (EOR)	% of Commodities*** in the Octroi Schedule
0–0.10%	2.3
0.11–0.20%	15.1
0.21–0.30%	19.8
0.31–0.40%	25.6
0.41–0.50%	12.8
0.51% and above	24.4
Total	**100.0**
Average Rate	**0.31%**

* Effective Octroi Rate = $\frac{\text{Specific Octroi Rate}}{\text{Consumer/Wholesale price}} \times 100.$

**For a sample of 23 cities.

***For 86 commodities in the Schedule.

Also, octroi rates vary significantly by type of commodity as shown in Table 3. Commodity groups with the lowest octroi rates are consumer durables with the average EOR of 0.26 percent. As opposed to this, food and drinks are among the highest octroi rate category with an average EOR of about 0.35 percent. EOR on sugar is 0.91 percent; on salt 0.71 percent; while on consumer durables like refrigerators, air

conditioners, and cars, it ranges from 0.1 percent to 0.45 percent. Therefore, there are initial indications of the existence of fiscal anomalies in the octroi structure which may exacerbate the regressivity of the tax incidence, reduce its buoyancy, and may have an impact on the efficiency of the tax. We next turn to a formal analysis of the determinants of octroi rates.

Table 3

Average Effective Octroi Rates by Type of Commodity

Type of Commodity	Average Effective Octroi Rate (%)
Consumer Goods	**0.30**
Food and Drinks	0.35
Consumer Durables	0.26
Others	0.25
Raw Materials/ Intermediate Goods	**0.36**
Capital Goods	**0.36**
Overall Average	**0.31**

3. THEORETICAL ANALYSIS OF THE DETERMINANTS OF OCTROI

Analysis of optimal octroi rates can potentially be undertaken by application of the Ramsey (1927) type of principles of optimal indirect taxation. The technical analysis is presented in the Appendix to the paper. It appears that the basic choice for municipal governments between octroi taxation of imported consumer goods or intermediate goods depends upon their relative concern for the impact on residents' welfare via taxation of consumer goods versus the impact on profits (and employment) of the taxation of intermediate goods. The theoretical framework developed by us enables a formal analysis of the determinants of the relative effective rates of octroi on consumer and intermediate goods respectively. Some of the principal conclusions which emerge from the theoretical analysis of the determinants of optimal octroi rates are as follows:

(1) If local councils are relatively more concerned about the impact of octroi rates on the profitability of industry and trade within the city than on the utility levels of residents arising from their consumption of goods, they are more likely to have lower octroi tax rates on intermediate goods than on consumer goods. This, of course, hinges on whether changes in the rates are seen as local or global in character. In the latter case, the impact on profitability of industry will be less.

(2) Given a certain revenue target, the level of octroi rates depends on the size of the tax base. Councils where imports of consumer or intermediate goods are high in relation to resident income will have lower tax rates, other things being equal.

(3) If the price elasticity of demand for imports of consumer goods is higher, then tax rates for such goods would tend to be lower, other things being equal. The same conclusion applies in the case of intermediate goods.

(4) If the revenue target of octroi is higher, then, other things being equal, tax rates on both consumer and intermediate goods will be higher.

Econometric analysis has been undertaken of octroi rates in a sample of councils to determine their degree of consistency with the theoretical principles enunciated above.

4. EMPIRICAL RESULTS

Given the qualitative nature of some of the above factors and data limitations, the impact of some of these factors on octroi rates has been captured through the use of dichotomous variables and proxies. Dummy variables for each type of good (basic consumer goods/luxury consumer good/intermediate goods/capital good) and different types of local councils (metropolitan corporation/municipal corporations/municipal committees/town committees) have been used. The latter are used to capture the impact of the size of the tax base on rates alongwith per capita industrial value-added since a major component of octroi tax base consists of industrial import.

The criterion related to economic efficiency implies that, other things being equal, lower octroi rates should be specified on those commodities the import demand for which is relatively price-elastic. Price elasticities for major food and non-food items in the urban areas of Pakistan have been estimated by Tariq (1994). As expected, these price elasticities are, by and large, low for most food items.

Analysis of the recent data on national imports and the income elasticity of the demand of different commodities has been undertaken to rank different commodities in terms of the buoyancy of demand. Income elasticity of major food and non-food items has been estimated by Tariq (1994) using a linear expenditure system. The study shows that, broadly speaking, income elasticity of major food items in urban areas ranges from 0.2 to 2.0. Some of the high income elasticity items include bakery products, poultry, fruits, butter and coffee/ovaltine, etc. Dummy variables have also been used to see if there are inter-provincial differences in octroi rate.

Based on the above, the following equation has been specified.

$$RATE_{ij} = \beta_0 + \beta_{iK} MTYPE_{Kj} + \beta_2 PE_i + \beta_3 IE_i + \beta_{4L} PROV_{Lj} + \beta_{5M} MSTAT_{Mj}$$
$$+\beta_6 PRICE_{ij} + \beta_{7K} PTYPE_{Kj} + \beta_{8L} PROV_{Lj} + \beta_{9M} PMSTAT_{Mj} + \beta_{10} PCIND_j + \varepsilon_{ij}$$

K = 1...3 for type of goods.
L = 1...3 for provinces.
M = 1...3 for type of municipal status.

where;

$RATE_{ij}$ = The octroi rate on the '*i*th' commodity in the '*j*th' local council.
$TYPE_{kj}$ = Type of good (basic consumer/luxury consumer/intermediate).
PE_i = Price elasticity of the '*i*th' commodity.
IE_i = Income elasticity of the '*i*th' commodity.
$PROV_{Lj}$ = Province (Balochistan/NWFP/Sindh).
$MSTAT_m$ = Type of local council (municipal corporation/municipal committee/ town committee).
$PRICE_{ij}$ = Price of the *i*th commodity in '*j*th' local council.
$PCIND_j$ = Per capita industrial value-added in the '*j*th' city.
$PTYPE_{kj}$ = Price of the '*i*th' commodity in '*j*th' city interacted with '*k*th' type of good.
$PROV_{Lj}$ = Price of the '*i*th' commodity in '*j*th' city interacted with '*l*th' province.
$PMSTAT_{mj}$ = Price of the '*i*th' commodity in the '*j*th' city interacted with '*m*th' type of municipal status.

Price variable has been interacted to see if effective octroi rates vary by type of good, type of local council, and provinces.

The above model has been applied to octroi rates of 86 commodities in 23 cities of varying population size and municipal status.[1] The results are presented in Table 4. The model specified is only able to explain less than half the variation in octroi rates. This indicates that for a large number of items, the rates diverge significantly from what would be implied on the basis of the application of above principles. Some of the key conclusions from the table are as follows:

(i) Intermediate goods appear to have somewhat lower rates than non-food consumer goods, while the lowest rates are observed for food items. This indicates that local councils do attach importance, first, to protecting local industry from decline in profitability levels and, second, to insulating lower income groups from the burden of octroi to the extent possible.
(ii) The industrial value-added per capita variable has a negative coefficient, as expected. This implies that in municipal jurisdictions where the level of import of intermediate goods is relatively high (because of greater industrial presence), octroi tax rates are lower.
(iii) Economic efficiency criteria appear to be implicit in the rate setting and some effort has been made, other things being equal, to specify lower rates for items which have relatively high price elasticity of demand.

[1]Sample cities include: Lahore, Karachi, Peshawar, Quetta, Hyderabad, Faisalabad, Rawalpindi, Sialkot, Bahawalpur, Gujranwala, Sargodha, Nawabshah, Charsadda, Kasur, Vehari, Rahim Yar Khan, Sheikhupura, Shabqadar, Raiwind, Mansehra and Shikarpur, Larkana.

Table 4

Determinants of Octroi Rates[a]

Variable	Coefficient	*t*-statistics
CONSTANT	−0.2186	−0.17
Type of good [$TYPE_k$]		
Food items	2.2223	1.57**
Intermediate goods	4.5600	2.49*
Luxury consumer goods	7.3910	3.72*
INCOME ELASTICITY [IE_i]	1.0563	0.61
PRICE ELASTICITY [PE_i]	−2.6100	−1.63**
PER CAPITA INDUSTIRAL VALUE-ADDED [PCIND]	-7.69×10^{5}	−1.11
MUNICIPAL STATUS [$MSTAT_m$]		
Municipal corporation	0.0002	1.61**
Municipal committee	0.0003	2.00*
Town committee	0.0006	2.76*
PROVINCE [$PROV_L$]		
Balochistan	5.9367	2.18*
NWFP	−1.3569	−0.81
Sindh	2.6308	1.87*
$PRICE_{ij2}$	0.0039	10.25*
$PRICE_{ij3}$	-1.62×10^{7}	−6.71*
$PRICE_{ij}$	1.68×10^{12}	4.04*
INTERACTIVE $TYPE_k$		
Food items	−0.0009	−2.72*
Intermediate goods	−0.0013	−3.45*
Luxury consumer goods	0.0002	1.50
INTERACTIVE $PRICE_{ij}/MSTAT_m$		
Municipal corporation	0.0002	1.61*
Municipal committee	0.0003	2.00*
Town committee	0.0006	2.76*
INTERACTIVE $PROV_L$		
Balochistan	0.0040	15.55*
NWFP	-8.80×10^{5}	−0.55
Sindh	0.0005	3.84*
CITY-SPECIFIC DUMMIES		
Shikarpur	−9.0127	−4.01*
Rahim Yar Khan	5.3218	2.48*
Sialkot	5.2816	2.47*
No. of observation	=	1901
$\overline{R}^2$	=	0.478
F-stat	=	73.55

[a] Tested for homoskedasticity.
* Significant at 5 percent level.
** Significant at 10 percent level.

(iv) A significant finding is that, other things being equal, rates are lower in the larger councils, and that rates tend to rise with a fall in municipal status, with town committees on the average having the highest rates. This may be a reflection partly of the restricted tax base and partly of lack of access to revenues from property tax which compel local governments in small towns and cities to resort to higher octroi taxation. Similarly, rates are higher on average in Balochistan, followed by Sindh, Punjab, and the NWFP. There is evidence that per capita expenditures in Sindh and Balochistan are relatively high [Pasha (1986)]. Therefore, higher rates may be necessitated by more ambitious revenue targets.

(v) Local councils do not appear to have a major concern for buoyancy of revenues in the fixation of octroi rates. The income elasticity variable does not emerge as significant, although it has the right sign.

(vi) Effective rates appear to rise initially with respect to price, then fall and rise again. Also, there appears to be a minimum flat rate imposed irrespective of the price. This diminishes the neutrality of the effective tax rate with respect to price.

Altogether, we have the conclusion that while on the average there is broadly some adherence to the principles of optimal indirect taxation in the context of octroi rate setting, there are still large deviations from these principles in the case of a number of commodities. Therefore, rationalisation of the octroi structure will require changes in the rates for such commodities which bring them closer to the level predicted by the regression line. More fundamental restructuring would require changes in the regression equation to reflect more effectively the considerations of economic efficiency, equity, and buoyancy.

Table 5 indicates commodities where rates at current levels are 'outliers' in relation to the predicted levels. These commodities ought to be targeted first in any effort at rationalisation of the octroi structure. The list includes consumer durables (like air conditioner, refrigerator, deep freezer, television, etc.), other consumer goods (like cigarettes, milk powder, ready-made garments, tea, etc.), and some intermediate goods (like bricks, acids, leather, tiles, etc.).

5. CONCLUSION

This paper analyses the determinants of octroi rates on major commodities for a sample of cities (in Pakistan) of varying population sizes and municipal status, and it formulates a judgement on the extent to which norms of optimal indirect taxation have been followed. The results indicate that while octroi rates are broadly in line with the contours of optimal taxation, and vary broadly with respect to prices, the nature of

Table 5

Candidate Commodities for Octroi Rate Rationalisation

S. No.	Names of Commodities	Number of Local Councils	Positive Outlier*	Negative Outlier*
1	Air conditioners	7	7	–
2	Bricks	1	1	–
3	Cigarettes of all kinds	2	2	–
4	Combs, brushes, etc.	1	1	–
5	Commercial acid, sulphuric acid, etc.	1	1	–
6	Cotton cloth	2	2	–
7	Electric bulbs & tubes	2	2	–
8	Hosiery of all kinds	1	1	–
9	Jute bags, etc.	1	1	–
10	Leather	1	1	–
11	Milk powder, glucose, etc.	1	1	–
12	Motor-cycles, scooters, etc.	6	6	–
13	Pepper (black), etc.	1	1	–
14	Pickles, etc.	1	1	–
15	Poultry	1	1	–
16	Perfumes, etc.	6	6	–
17	Ready-made garments, etc.	3	2	1
18	Refrigerators & deep freezers	7	7	–
19	Sewing-machines, knitting-machines	1	–	1
20	Shaving creams & blades	2	1	1
21	Silk cloth	1	1	–
22	Tables, chairs, sofas, etc.	1	1	–
23	Tablets of all kinds	3	3	–
24	Tea, coffee, cocoa, etc.	1	1	–
25	Television	2	2	–
26	Tiles & glazed tiles	3	3	–
27	Washing machines	5	5	–
28	Woollen cloth	3	3	–

*An outlier is an observation whose value exceeds the value of other observations in the sample by perhaps two standard deviations away from the mean value of all the observations.

good, size of tax bases, municipal status, considerations of equity, buoyancy, and minimisation of distortion have not adequately been taken into account. Criteria of fixation of octroi rates, based on norms of optimal taxation, are specified, and a rationalisation of octroi rates is accordingly suggested.

Appendix

THE THEORETICAL FRAMEWORK OF OPTIMAL OCTROI RATES ANALYSIS

The optimal octroi rates problem is set up in the context of a city which is small in relation to the rest of the country/world and, therefore, faces *exogenously* given (metropolitan) *border prices*. These prices can be enhanced at the point of entry into the city by levy of octroi. The import supply curve is perfectly elastic. In other words, we do not allow for the existence of import quotas.

(a) Types of Goods

Four types of goods are distinguished, as follows:

Imported Consumer Good

This is a composite good of consumer goods imported into the city either internationally or from the rest of the country. It is assumed that these goods are *non-competitive* in character with respect to production within the city. Such an assumption has been made at the national level by Ahmed and Stern (1991). It seems even more likely in the context of an individual city which is likely to show greater specialisation in its economic activities, depending upon locational factors, etc.

Included in this category are food items like wheat (atta), rice, sugar, fruits, tea, vegetables, etc. It is unlikely that a significant quantum of food production takes place within the metropolitan boundaries. Other non-competitive goods could include various types of consumer durables. In addition, if we allow for product differentiation between imports and domestic production, then the assumption of the non-competitive nature of imports is likely to be more valid. This category of goods is referred to as *good 1*.

Imported Intermediate Good

It is also assumed that this is a composite good of non-competitive intermediate good imports. Imports of edible oil, POL products, chemicals, building materials, etc., fall into this category. This composite good is defined as *good 2*.

Domestic Consumer Good

This is a composite good of consumer goods produced within the city and partially exported either to the rest of the country or abroad. Textile products, for

example, fall into this category. This composite good is referred to as *good 3*.

Domestic Intermediate Good

This is a composite good of intermediate goods produced within the city and partially exported to the rest of the country or abroad. Production of cotton yarn may fall into this category in the context of Karachi. This composite good is referred to as *good 4*.

(b) Input-Output Relationships

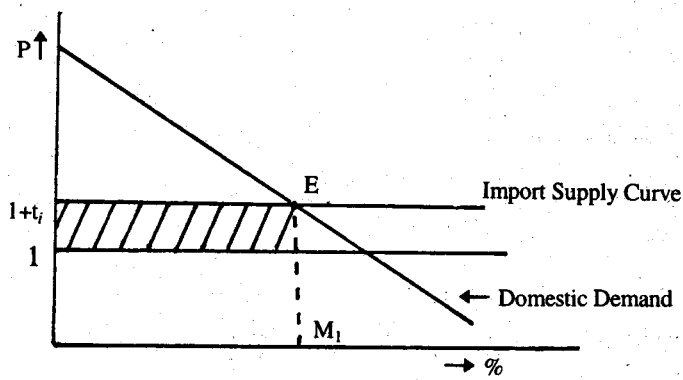
As a simplifying assumption regarding input-output relationships within the city, we assume that only intermediate goods are used in the production of other goods. That is, consumer goods enter final consumption by households only. Therefore, we specify the input-matrix as follows:

Input of	Output of	
Good 2	Good 2	Good 4
Good 4	m_{32}	m_{42}
	m_{34}	m_{44}

The m's are input-output coefficients.

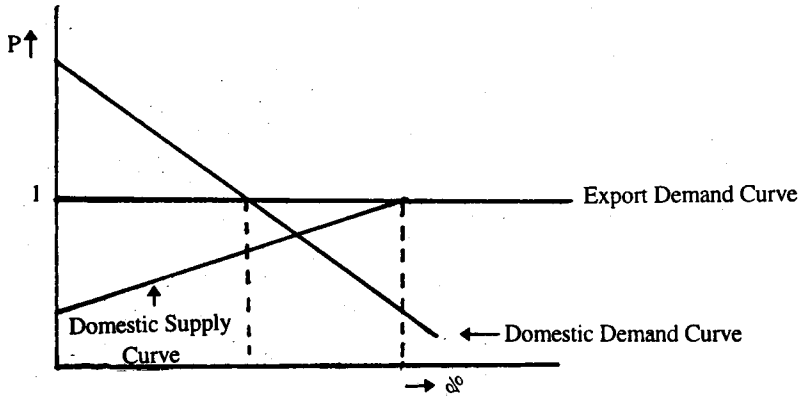
(c) Nature of Market Equilibrium

For the imported consumer good, the market equilibrium is depicted below:



In the absence of octroi, it may be noticed that initially the import price is normalised to unity. E represents the equilibrium following the imposition of octroi at the rate of t_i. M_1 is the quantity imported and the shaded area is the octroi revenue.

For the domestic consumer good, the equilibrium is shown below:



In this case, the export price is unaffected by the imposition of octroi at the import stage. There is no octroi revenue directly from such goods as the level of import is zero. The level of export (to the rest of the country or abroad) is represented by X_3.

Market equilibrium for the domestically produced intermediate good can essentially be characterised in the same manner as that for the domestic consumer good. In the case of imported intermediate good, there is derived demand from production within the city of consumer and intermediate goods.

(d) Prices

As indicated above, in the absence of octroi all consumer/user prices are initially normalised to unity. Octroi is collected only from imported consumer and intermediate goods. We designate the octroi rates as follows:

t_1 = octroi rate on the composite imported consumer good.
t_2 = octroi rate on the composite imported intermediate good.

It may be noted that at this stage we do not allow for any difference in octroi rates between sea, air, and land dues on the same commodity.[2]

The basic problem is one of determining the optimal magnitudes of t_1 and t_2. In this analysis, we are concerned with the determination of octroi rates only in the case of commodities which are actually imported. The octroi schedules, of course, cover all goods but there is some redundancy in the rate fixation as not all of these goods are imported in any significant quantity.

[2]There are limits to the extent of difference between rates for the same commodity at different posts; otherwise arbitrage will take place.

Given the imposition of octroi, the prices in the city are as follows:

	For the Imported Consumer Good	For the Imported Intermediate Good	For the Domestic Consumer Good	For the Domestic Intermediate Good
Type of Price				
Consumer/User Price	$P_1=1+t_1$	$P_2=1+t_2$	1	1
Local Producer Price	–	–	p_3	p_4

where $p_3 = 1-m_{32}(1+t_2)-m_{34}$ and $p_4 = 1-m_{42}(1+t_2) - m_{44}$.

Therefore, it may be noticed from above that the levy of octroi on imported intermediate good does not affect local consumers directly. It, however, reduces the profitability of local industry by reducing p_3 and p_4.

(e) Consumer Equilibrium

The process of utility maximisation for the typical consumer is given by

$$Max\ U = U(q_1, q_3)$$

subject to $p_1q_1 + q_3 = y$, where y is essentially treated as an income endowment.

This yields: $q_1 = q_1(p_1, y)$

$$q_3 = q_3(p_1, y)$$

and $V = V(p_1, y)$ is the indirect utility function.

Applying the envelope theorem to the Lagrangian function we have

$$\frac{\partial V}{\partial t_1} = -\lambda q_1, \text{ where } \lambda \text{ is the Lagrangian multiplier and } \lambda = \frac{\partial V}{\partial y}.$$

It is obvious that $\frac{\partial V}{\partial t_2} = 0$.

A levy on imported intermediate good does not affect the consumer directly.

(f) Industry Equilibrium

The process of profit maximisation in a typical industry is given by:

$$\pi_i = P_iQ_i(K_i, L_i) - wL_i - \tau K_i \quad i = 3, 4$$

Maximisation of π_i with respect to L_i and K_i with exogenously given w and τ and application of the envelope theorem leads to

$$\frac{\partial \pi_i}{\partial P_i} = Q_i \quad \text{where } Q_i = S_i(P_i)$$

and S_i is supply by industry i.
Therefore,

$$\frac{\partial \pi_i}{\partial t_i} = Q_i \frac{\partial p_i}{\partial t_i}$$

This leads to

$$\frac{\partial \pi_3}{\partial t_1} = -m_{32} S_3$$

$$\frac{\partial \pi_4}{\partial t_2} = -m_{42} S_4$$

(g) Octroi Revenue Function

The octroi revenue T is given by

$$T = t_1 M_1 + t_2 M_2$$

where $M_1 = D_1$ and $M_2 = m_{32} S_3 + m_{42} S_4$

(h) Social Welfare Function

We assume that elected representatives/officials of the city government are concerned both about the utility level of households (the electorate) living in their jurisdiction and also about the profit level of trade and industry in the city. The relative importance of these two factors depends upon the degree of representation in the house of the local council of different interests.

The utility level of all residents is give by

$$W = \sum_{i=1}^{N} U_i$$

where there are N households in the city. Utilities are assumed to be additive in this specification. The profit level of economic activities in the city is given by

$$\pi = \pi_3 + \pi_4$$

The *Social Welfare Function*, F, then is given by

$$F = F(W, \pi)$$

F has the properties of a conventional utility function.
From the previous sections we have that

$$\frac{\partial W}{\partial t_1} = \sum_{i=1}^{n} (-\lambda q_1)$$

On the assumption that all households are indentical,

$$\frac{\partial W}{\partial t_1} = -\lambda M_1$$

(Since domestic production is zero)

Of course, $\frac{\partial W}{\partial t_2} = 0$

Similarly $\frac{\partial \pi}{\partial t_2} = -m_{32} S_3 - m_{42} S_4 = -M_2$

In summary,

$$\frac{\partial W}{\partial t_1} = -\lambda M_1 \text{ and } \frac{\partial \pi}{\partial t_2} = -M_2$$

(i) The Optimisation Problem

We are finally in a position to set up the optimisation problem as follows:

$$\ell_2 (t_1, t_2, \mu) = F(W, \pi) + \mu [\bar{R} - t_1 M_1 - t_2 M_2]$$

where $\bar{R}$ is the exogenously given revenue target for octroi.
The first-order conditions are,

$$\frac{\partial \ell_2}{\partial t_1} = \frac{\partial F}{\partial W} \bullet \frac{\partial W}{\partial t_1} + \mu \left[-t_1 \frac{\partial M_1}{\partial t_1} - M_1 \right] = 0$$

$$\frac{\partial \ell_2}{\partial t_2} = \frac{\partial F}{\partial \pi} \bullet \frac{\partial \pi}{\partial t_2} + \mu \left[-t_2 \frac{\partial M_2}{\partial t_2} - M_2 \right] = 0$$

$$\frac{\partial \ell_2}{\partial t} = \bar{R} - t_1 M_1 - t_2 M_2 = 0$$

Substituting the earlier results we have,

$$\frac{\partial F}{\partial W}\cdot(-\lambda M_1)+\mu\left[-t_1\frac{\partial M_1}{\partial t_1}-M_1\right]=0$$

This can be transformed to

$$+\lambda\frac{\partial F}{\partial W}+\mu\left[+\left(\frac{t_1}{P_1}\right)\varepsilon_1+1\right]=0 \quad \varepsilon_1 = \text{price elasticity of demand for import of consumer good} \quad \text{(A)}$$

Similarly,

$$\frac{\partial F}{\partial \pi}(M_2)+\mu\left[t_2\frac{\partial M_2}{\partial t_2}+M_2\right]=0$$

This can be transformed into

$$\frac{\partial F}{\partial \pi}+\mu\left[\left(\frac{t_2}{P_2}\right)\varepsilon_2+1\right], \quad \varepsilon_2 = \text{price elasticity of demand for import of Intermediate good} \quad \ldots \quad \text{(B)}$$

Also, we can write the revenue constraint as

$$\left(\frac{t_1}{P_1}\right)(P_1M_1)+\left(\frac{t_2}{P_2}\right)(P_2M_2)=\bar{R} \qquad \ldots \qquad \ldots \qquad \ldots \qquad \text{(C)}$$

Then we have a three equation system (A), (B) and (C) — which can be solved to yield μ and the optimal values of t_1 and t_2.

(j) Simulations

Suppose that the utility function for the typical local household is given by

$$U=q_1^{\alpha}q_2^{1-\alpha}$$

Then it can be derived in this case that the indirect utility function is given by

$$V=\frac{Ay}{(1+t_1)^{\alpha}} \quad \text{where } A=\alpha^{\alpha}(1-\alpha)^{1-\alpha}$$

$$\frac{\partial V}{\partial y}=\frac{A}{(1+t_1)^{\alpha}}$$

and a Cobb-Douglas social welfare function, F,

That is $F = W^{\beta}\ \pi^{1-\beta}$

$$\frac{\partial F}{\partial W} = \frac{\beta F}{W}$$

$$\frac{\partial F}{\partial \pi} = \frac{(1-\beta)F}{\pi}$$

where $W = NV$. V is the utility level attained by each household.
Then, dividing Equation (A) by Equation (B) we have,

$$\frac{\beta F \dfrac{\partial V}{\partial y}\pi}{NV(1-\beta)F} = \frac{\tau_1\varepsilon_1 + 1}{\tau_2\varepsilon_2 + 1}$$

Substituting for $\dfrac{\partial V}{\partial y}$ and V from above we obtain

$$\frac{\beta\pi}{(Ny)(1-\beta)} = \frac{\tau_1\varepsilon_1 + 1}{\tau_2\varepsilon_2 + 1}$$

Where $\tau_1 = \dfrac{t_1}{P_1}$ and $\tau_2 = \dfrac{t_2}{P_2}$ are the effective octroi rates on the consumer price.
Suppose that we designate as s the share of profits in income

i.e., $s = \dfrac{\pi}{Ny}$

Then $\dfrac{\beta s}{(1-\beta)} = \dfrac{\tau_1\varepsilon_1 + 1}{\tau_2\varepsilon_2 + 1}$

This leads to

$$\frac{\beta s\varepsilon_2}{(1-\beta)}\tau_2 + \frac{\beta_3}{(1-\beta)} = \tau_1\varepsilon_1 + 1$$

Therefore,

$$\varepsilon_1\tau_1 - \frac{\beta s\varepsilon_2}{(1-\beta)}\tau_2 + \frac{\beta s}{(1-\beta)} - 1 \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

We have from the revenue constraint that

$$\tau_1\left(\frac{P_1M_1}{\overline{\overline{N}}y}\right)+\tau_2\left(\frac{P_2M_2}{\overline{\overline{N}}y}\right)=\left(\frac{\overline{R}}{\overline{\overline{N}}y}\right)$$

We designate the following,

$$m_1=\frac{P_1M_1}{\overline{\overline{N}}y},\quad m_2=\frac{P_2M_2}{\overline{\overline{N}}y},\quad r^*=\frac{\overline{R}}{\overline{\overline{N}}y}$$

Then the equation is transformed to

$$m_1\tau_1+m_2\tau_2=r^* \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

Therefore, Equations (1) and (2) constitute a two-equation system which can be solved to yield the values of τ_1 and τ_2, as follows:

$$\tau_1=\frac{m_2\{\beta s(1-\beta)\}+\beta s\varepsilon_2\tau^*}{\varepsilon m_2(1-\beta)+\beta s\varepsilon_2 m_1} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

$$\tau_2=\frac{\varepsilon_1\tau^*-m_1\left\{\frac{\beta s}{1-\beta}-1\right\}}{\varepsilon_1 m_2+\frac{\beta s\varepsilon_2 m_1}{(1-\beta)}} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

which leads to

$$\tau_2=\frac{\varepsilon_1\tau^*(1-\beta)-m_1\{\beta s-(1-\beta)\}}{\varepsilon_1 m_2(1-\beta)+\beta s\varepsilon_2 m_1} \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

τ_1 in (4) and τ_2 in (5) are the optimal octroi rates, given the revenue target, τ^*. The results of comparative statistics on Equations (1) and (2) are as follows:

	Changes in	
Due to Change in	τ_1 [Consumer Goods]	τ_2 [Intermediate Goods]
β	−	+
s	−	+
m_1	−	−
m_2	−	−
ε_1	+	−
ε_2	−	+
τ^*	+	+

REFERENCES

Ahmed, E., and N. Stern (1991) *The Theory and Practice of Tax Reforms in Developing Countries*. Cambridge: Cambridge University Press.

Ghaus, A., and H. A. Pasha (1989) A Model of Municipal Finances. Karachi: Applied Economics Research Centre, University of Karachi. (Research Report.)

Iqbal, Qamar (1986) An Economic Analysis of Octroi. Unpublished MAS Thesis. Karachi: Applied Economic Research Centre, University of Karachi.

Karachi Master Plan 1974.

Pasha, H. A., *et al.* (1988) Municipal Finances in Pakistan. Karachi: Applied Economics Research Centre, University of Karachi. (Research Report.)

Ramsey, F. P. (1927) A Contribution to the Theory of Taxation. *Economic Journal.*

Tariq (1994) Utility-constant Cost of Living Index in Pakistan. Karachi: Applied Economics Research Centre, University of Karachi. Unpublished MAS Thesis.

Comments

This is an interesting paper on the question of the determinants of rates of Octroi taxes, an area which has been greatly neglected in the empirical work in Pakistan. Octroi is a tax imposed by local governments in Pakistan on certain commodities imported into the municipal limits for local use, sale or consumption. These taxes are indirect in nature and generally are supposed to be inefficient. Hence they are not popular in most of the developed countries.

The authors have tried to determine the efficiency of octroi taxes through their adherence to certain principles of optimal commodity taxation. The authors have also tried to see whether or not the regressivity, inelasticity, and inefficiency (if any) in octroi are due to its rate structure. The main exercise of the study is the analysis of the determinants of octroi rates in Pakistan. Based on the regression equation reported on Page 9 of the paper (as presented in the conference), the major conclusion drawn by the authors is that the octroi taxes are broadly in line with the contours of optimal taxation. This is a somewhat surprising result, given the existing methods of octroi tax collection and the auction procedure by itself. Tax evasion and irregularities in the collection procedures are largely reported in this source of revenues alongwith the high collection and compliance (transport and delay) costs relative to the revenue generated. Hence the conclusion that it is in line with the contours of optimal taxation is not convincing.

Maybe there are some other ways to analyse the main hypothesis of the paper. First, since the conclusion is based on the assumption that for each locality/district/town the prices are exogenous, one can use a little relaxed assumption of exogenous prices and prove that the octroi taxes are really inefficient in Pakistan. Secondly, it is very hard to relate the regression equation reported (on page 9 of the paper presented at the conference) with the overall model derived in the Appendix. In the Appendix, the equations derived from the model are non-linear in parameters. It is not mentioned nor clear from the paper that the equation specified (on page 9 of the paper as presented at the conference) is some form of transformation of the equation derived in the Appendix. Alternatively, one can try the non-linear regression techniques, which can reverse the conclusion drawn in the paper: that the octroi taxes in Pakistan are in fact inefficient.

There are some other minor observations about the paper which are as follows. (a) None of the sections in the paper describes the data set used in the study, making it impossible to comment on the validity and reliability of the data used. The authors should include a small section on the description of the data used, and the sampling frame and methods. (b) Most of the tables in the text do not indicate the year or source of the data used.

Overall, the authors have addressed a problem which is very hard to analyse. I congratulate them for doing such a disaggregate analysis of Octroi taxes.

Syeda Fizza Gillani

Pakistan Institute of
Development Economics,
Islamabad.