A THEORETICAL ANALYSIS OF SMUGGLING *

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In some underdeveloped countries smuggling takes on large proportions and is a major economic problem. In Afghanistan as much as one quarter to one fifth of total foreign trade is believed to be smuggling trade.\(^1\) Other countries in the East, certainly Indonesia, and a number of African countries also have this problem. There is a need, therefore, to look at smuggling not only as a moral and legal problem but also as a purely economic phenomenon.

It is commonly argued that smuggling must improve economic welfare since it constitutes (partial or total) evasion of the tariffs (or quantitative restrictions), which, for a small country, would signify a suboptimal policy. We propose to demonstrate in Section I of this paper the falsity of this view, while also investigating the restrictive conditions under which smuggling may improve welfare.

Since, however, the tariff may be, and often is, levied to achieve specific objectives, such as protecting import-competing production or collecting revenue, we should also want to compare the welfare levels reached under tariffs with and without smuggling, subject to such exogenously specified objectives. In Section II we do this for the case of protecting production and show that the achievement of a given degree of protection to domestic importable production, in the presence of smuggling, produces lower welfare than if smuggling were absent. In Section III, we extend our analysis to the phenomenon of faked invoices.\(^2\)

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2. Alan Manne has called our attention to an early attempt to analyze smuggling by the famous Italian eighteenth-century (1738-1794) criminologist and economist Cesare Bonesana, Marchese di Beccaria (Cesare Beccaria, "Tentativo Analitico Sui Contrabbandi," Estratto dal foglio periodico intitolato: il Caffé (Vol. I, Brescia, 1764-65); reprinted in Scrittori Classici Italiani di
I. Smuggling and Welfare

In the following analysis, we apply the Hicks-Samuelson value theoretic framework, which is customarily used in the traditional theory of international trade. We further assume that primary factors, in perfect competition, produce (two) traded goods and that the country is small — i.e., the terms of trade are fixed. We shall assume a given, well-behaved community indifference map. This assumption could be given up without altering any conclusions: it is retained only for convenience of exposition.

Since smuggling merely represents, from a welfare point of view, yet another way in which exportables are transformed into importables, we must represent it as a smuggling transformation (or offer) curve. However, it is clear that this transformation curve must be less favorable than the terms of trade.

We next have the option of assuming that smuggling is either competitive or monopolistic and that the smuggling offer curve is

Assume that a merchant's investment in merchandise is $u$ and that the tariff duty to be paid thereon is $t$. The rate of tariff is thus $\tau = t/u$. With smuggling the value of the merchandise successfully brought through the controls without payment of tariffs is $x$. Thus $(u-x)$ has been confiscated. Since the successfully smuggled commodities may be sold at domestic market price, the condition for smuggling to break even is clearly $x(1+\tau) = u$, or, as Beccario presents it, $x + t x/u = u$. He then develops this expression into something that perhaps can be described as isoprofit curves, but does not get anywhere with his analysis, and finally expresses the hope that it may prove useful as a starting point for further analysis.

It is, indeed, easy to develop Beccario's analysis. Let $p$ denote the smuggler's total profit. We then have $p = x(1+\tau) - u$. Let $p/u = \tau$ be the rate of profit and $x/u = z$ be the probability for success in smuggling. We have then immediately $1+\tau = z(1+\tau)$. Assume now that the "normal" rate of profit is $\tau^*$. For smuggling to be unprofitable the tariff rate has to be set so that $1+\tau^* = z$. If, on the other hand, the sovereign can work on the probability of successful smuggling through increased supervision — the more supervision, the lower is $z$ — our relation shows the trade-off between increased supervision and increased tariff rates (revenues). To judge from his text it was precisely this trade-off that Beccario was looking for — natural for a criminologist.

From a national point of view commodities are not lost because they are confiscated, of course. Nonetheless, Beccario's analysis introduces a private cost factor, the risk of being caught, that certainly is important for determining the volume of smuggling and that our analysis does not deal with.

(Pierluigi Molajoni translated Beccario's article and has helped us with the interpretation.)

3. As James Kearl has remarked to us, however, there may be relatively minor instances of smuggling at more favorable terms of trade — as when LDC-resident Americans with subsidized PX sources of foreign goods may be willing to resell these goods in their host-LDC's at prices that fall below legal channel prices.
characterized by either a constant rate of transformation or an increasing rate of transformation. We consider all these options in the following analysis. For the sake of simplicity we shall assume that the individual smuggler has a constant marginal rate of transformation. When we assume increasing marginal rates of transformation for the smuggling industry as a whole, we retain the assumption of individual constant rates of transformation. The industry's increasing rate of transformation is thus exclusively due to intra-industrial, interfirm diseconomies of scale. This assumption permits us in a simple way to deal with both perfect competition and monopoly without loss of generality.

With perfect competition in smuggling, both the foreign price (the terms of trade) and the domestic price are given to the individual smuggler. With monopoly in smuggling, however, several possibilities are open. We shall use a minimum assumption to the effect that, whereas the monopolistic smuggler knows and takes into account the form of the (smuggling) industry's transformation curve, he does not consider the effect on domestic prices of a change in the volume of smuggling. We have in fact also studied the case in which the monopolistic smuggler does consider domestic price effects. But our conclusions remain valid in this case as well. Hence, for reasons of space, we do not present this analysis here. Moreover, we cannot possibly take up here all possible cases of imperfect competition.

We also assume that, in the monopolistic smuggling case, the smuggler is a "nonresident" whose profits therefore do not constitute welfare for the country that experiences smuggling. The question of the residence of the smuggler clearly does not arise, however, in the case of competitive smuggling; for, under our assumptions, the smuggling profits under competition would be zero.

4. We disregard the petty smuggling of tourists that is done at zero marginal costs (economically). Our concern is large-scale smuggling on a commercial basis.

5. At constant costs our monopolistic smuggler clearly behaves in exactly the same way as a competitive smuggling industry would do. And at increasing costs he behaves as a competitive smuggling industry does at increasing costs for the individual smuggler without intra-industry diseconomies.

6. We could assume that the smuggler is a resident of the country or, which is very realistic in some primitive countries where smuggling is a large industry, that the smugglers really belong to no country. In Afghanistan nomadic tribes move across the borders to and from Pakistan and Iran, and some of them make a living from smuggling (Smith, op. cit., pp. 328 ff.). They are "countries without fixed territory." Either country, or both, may include the nomads in their population and national income estimates, but such statistical conventions do not integrate the nomads with either country!

7. We should clarify, however, that the results for the monopolistic
Perfect Competition in Smuggling at Constant Costs

In Figure I, $AB$ is the production possibility curve and the slope of $PfCf$ (= the slope of $PtCt$) is the fixed, international terms of trade. The domestic price, inclusive of the tariff but in the absence of smuggling, is tangent to $AB$ at $Pt$. If free trade prevailed, welfare would be at $U_f$, whereas with the tariff, but without smuggling, it would be at $U_t$.

With smuggling, however, the smuggling transformation curve is $PsCs$ (steeper than $PfCf$, but less steep than the tangent at $Pt$); the domestic price faced by producers and consumers is $PsCs$, and the welfare is $Us$.

Since $Us < U_t$, we have here a case where smuggling has reduced welfare below what it would be in the absence of smuggling. Smuggling becomes a welfare-reducing phenomenon, contrary to common belief.

On the other hand, Figure II depicts a case where $Us > U_t$: smuggling has improved welfare. We can therefore conclude:

For nonprohibitive tariffs, and constant costs smaller than the tariff-included price and perfect competition in smuggling, smuggling cannot be uniquely welfare-ranked vis-à-vis non-smuggling.

The rationale underlying this conclusion is readily seen by analogy with the analysis of the welfare effects of a trade-diverting customs union. Smuggling is analogous to admitting a "partner country" as an importer at higher cost than the "outside country"; smuggling therefore imposes a terms of trade loss, but the production and consumption gain may outweigh this loss, as they do in Figure II, but not in Figure I. Thus, we cannot tell in general whether smuggling is welfare-improving or not — compared to legal trade with the tariff.8

smuggling case, showing that smuggling may be harmful, do not critically depend on the assumption that the smuggler is a nonresident. While it may be thought that the country must be worse off from the exercise of monopoly power from abroad, it must be remembered at the same time that the monopolist smuggler maximizes along an "inferior" transformation curve and not along the "legal" offer curve.

8. We might add, however, that, if we were to draw the tangent to the production possibility curve $AB$ and the no-smuggling tariff situation utility curve $Ut$ in Figures I and II, and define the point of tangency with $AB$ as $Ps$, we can distinguish two zones (in analogy with the trade-diverting customs union theory): Zone I, defined as the range of smuggling offers that would yield smuggling situation equilibrium production between $Pt$ (excluded) and $Ps$ (excluded), where the smuggling must necessarily improve welfare over the non-smuggling situation; and Zone II, defined similarly over the range from $Ps$ (excluded) to $Pt$ (included), where the smuggling must necessarily worsen welfare.
With free trade, production possibility curve $AB$, and given international price line $P_tC_t$, the welfare (maximum) is at $U_t$. With tariff, the production, consumption, and welfare are at $P_t$, $C_t$, and $U_t$, respectively, provided that no smuggling takes place. With smuggling, at constant price line (transformation line) $P_sC_s$, less steep than the tangent to $AB$ at $P_t$, legal trade ceases and welfare ends up at $U_s < U_t$. Hence, smuggling reduces welfare.

In both Figures I and II legal trade is eliminated, given the assumption that the smugglers' transformation line is less steep than the tangent to the country's production frontier at $P_t$; when the competitive smugglers' costs are constant and lower than the tariff-included price, legal trade cannot survive.9 Were the smugglers' transformation line steeper than the tangent at $P_t$, smuggling would, on the other hand, cease completely, and legal trade prevail. But there is here a borderline case in which smuggling and legal trade may coexist. When the smugglers' transformation line coincides with the tangent at $P_t$, smugglers' constant costs are equal to the tariff-included price and smuggling may or may not prevail. Unfortunately our assumptions leave, strictly speaking, the division

9. John Pettengill has remarked to us, however, that governmental agencies may be compelled to buy through legal channels, in which case legal imports at higher cost could coexist with illegal imports by the nongovernmental sector at lower cost. We exclude this possibility in the analysis in the text.
Perfect Competition in Smuggling at Constant Costs (cont.)

This figure is identical with Figure I, except that now smuggling improves welfare: $U_t > U_t$. With the smugglers' transformation line less steep than the tangent at $P_t$, legal trade is again eliminated.

Nevertheless, we can state unequivocally that in this case smuggling must be a welfare-reducing activity. Figure III shows that no matter how much or how little smugglers trade, trade exclusively on a legal basis would be better. If the smugglers have all trade, as at point $C_s$ at welfare level $U_s$, $C_t$ at the welfare level $U_t$ must clearly be better: $U_t > U_s$. And with smuggling at $Q$ and legal trade at $C_s, t$, we have $U_t > U_{s, t}$. We have thus the following result:

For nonprohibitive tariffs, and constant costs equal to the tariff-included price and perfect competition in smuggling, legal trade and smuggling may coexist. In this case, no smuggling is better than any amount of smuggling; and the less smuggling, the better.

Perfect Competition in Smuggling at Increasing Costs

We now consider the case where there are increasing costs in smuggling, while it continues to be competitive. It is clear that, in this case, we can have smuggling coexisting with legal trade, whereas in the preceding case, with constant costs in both smuggling and
In this figure, the smugglers' transformation line, $P_sC_s$, coincides with the tangent to $AB$ at $P_t$ ($=P_s$). If the smugglers have all trade, the welfare level will be $U_s$, with the consumption point $C_s$. $C_s$ is clearly inferior to $C_t$; therefore $U_s < U_t$. With smuggling at $Q$, legal trade will lead to the consumption point $C_{s,t}$ at welfare level $U_{s,t}$. We have always $U_s < U_{s,t} < U_t$. The first inequality is obvious; it means that some legal trade is better than no legal trade. The second inequality follows from the circumstance that, if $U_s < U_{s,t}$, which is easily seen to be possible, there would exist at least one more equilibrium point on the trade line, $P_tC_t$, at a higher welfare level than $U_{s,t}$ (J. Bhagwati, "The Gains from Trade Once Again," *Oxford Economic Papers*, XX (1968), 137-48).

legal trade, smuggling, if profitable at all, eliminated legal trade apart from a special borderline case. This possibility of legal trade coexisting with smuggling is not merely a theoretical curiosum: in real life it is probably the most common case, and, as we show below, it turns out to be critical to the welfare effects of smuggling (indeed, as we have already seen in the borderline case above).

Let us initially discuss the cases where smuggling eliminates trade, despite increasing costs. Figure IV illustrates this possibility. The smuggling transformation curve, $P_sC_s$, now exhibits diminishing returns, and the equilibrium under smuggling shows the domestic price ratio, at which production and consumption take place, to be
This figure is identical with Figure I, but we now have increasing costs in smuggling. The transformation curve for smuggling is $P_sC_sS$, and the equilibrium for the smuggling situation is characterized by production at $P_s$, where the average (recall the assumption of individual constant rate of transformation) transformation rate in smuggling (the straight line, $P_sC_s$) is tangential to $AB$ and by consumption at $C_s$, where the same rate is tangential also to $U_s$. Again, legal imports are eliminated, and $U_s < U_t$.

On the other hand, Figure V shows just the opposite: $U_t < U_s$, and smuggling has improved welfare. Thus, we have the following result:

For nonprohibitive tariffs, and increasing costs and perfect competition in smuggling, smuggling cannot be uniquely welfare-ranked vis-à-vis nonsmuggling when legal trade is eliminated by smuggling.

Consider, however, the case where legal trade is not eliminated in the smuggling situation. Figure VI, which is variant on Figures IV and V, illustrates this case. In the smuggling situation, the domestic price will now be the tariff-inclusive price: so both production (at $P_s$) and consumption (at $C_s$) must be at tariff-inclusive
Perfect Competition in Smuggling at Increasing Costs (cont.)

This figure is identical with Figure IV, except that we now show smuggling to result in greater welfare than legal trade: $U_s > U_t$. Again, in the smuggling situation, legal imports are eliminated.

prices. The point of trade on the smuggling transformation curve, $P_sQS$, must be (at $Q$) where the average terms of trade (we have individual constant returns) are again the same as the domestic price ratio. However, legal trade must occur at the international price ratio, the slope of $QC_s$. It is clear, then, that smuggling worsens welfare, and we thus have the result:

For nonprohibitive tariffs, and increasing costs and perfect competition in smuggling, when legal trade is not eliminated, smuggling necessarily reduces welfare vis-à-vis the nonsmuggling situation.

The rationale for this result is again readily seen. The smuggling situation, vis-à-vis the nonsmuggling situation, now imposes identical production and consumption distortions on the economy, while also imposing a terms of trade loss; smuggling must therefore necessarily be a welfare-reducing phenomenon in this instance.

Monopoly in Smuggling at Constant Costs

When smuggling is monopolistic, the marginal rate of trans-

\[ P_sQS \]

\[ O \rightarrow B \rightarrow X-IMP \]

\[ A \rightarrow P_f \]

\[ Y-EXP \]

\[ P_s \]

\[ P_t \]

\[ C_f \]

\[ C_s \]

\[ U_t \]

\[ U_s \]

\[ S \]

\[ QC_s \]
This diagram shows a situation where smuggling and legal trade coexist in equilibrium. The production points, $P_t$ and $P_s$, therefore coincide; smuggling takes the availability point to $Q$ and legal trade takes it then, at international prices, to $C$, and welfare $U_s < U_t$ (the welfare that would be achieved under legal trade alone); see caption for Figure III concerning the possibility of $U_s > U_t$, in case of multiple equilibria.

formation in smuggling will be equated with the domestic price ratio. However, for constant costs in smuggling, the marginal and average rates of transformation are identical, and hence the results are identical with the case where smuggling is competitive. Hence we can conclude:

For nonprohibitive tariffs, and constant costs and monopoly in smuggling, smuggling cannot be uniquely welfare-ranked vis-à-vis nonsmuggling.

Monopoly in Smuggling at Increasing Costs

However, when there are increasing costs in smuggling, we have to distinguish between marginal and average terms of trade in smuggling. As with the competitive case, we find that the ranking of smuggling vis-à-vis nonsmuggling is critically dependent on whether smuggling eliminates legal trade.
Monopoly in Smuggling at Increasing Costs

This figure is similar to Figure V: legal trade is eliminated and $U_s > U_t$. However, instead of depicting smuggling on the perfectly competitive assumption, we now equate the marginal rate of transformation in smuggling (at $C_s$) with the marginal rate of transformation in domestic production and domestic prices (at $P_s$). Smuggling improves welfare over the legal trade situation.

In Figure VII, we illustrate a case where smuggling does eliminate legal trade. The difference from Figure V, where the case of competitive smuggling under increasing costs was discussed, is that the smuggling equilibrium is characterized by equality of domestic prices and the marginal rate of transformation in smuggling—the tangents to the production possibility curve $AB$ at $P_s$, to the transformation curve $P_sS$ at $C_s$, and to the social indifference curve $U_s$ at $C_s$ are parallel. We here depict a case where $U_s > U_t$: smuggling is welfare-improving. We could, however, equally readily have redrawn the diagram to show $U_s < U_t$—i.e., that smuggling had reduced welfare.

We thus have the following proposition:

For nonprohibitive tariffs, and increasing costs and monopoly in smuggling, smuggling cannot be welfare-ranked vis-à-vis nonsmuggling when legal trade is eliminated by smuggling.

We note, therefore, that the conclusions are identical regardless of whether smuggling is competitive or monopolistic.
Consider now, however, the case where smuggling fails to eliminate legal trade. Figure VIII illustrates this case. As with the competitive smuggling case, we find that $U_s < U_t$ and that smuggling necessarily reduces welfare. Again, it is easy to see why: with legal trade continuing, the distortion in domestic production and consumption must be identical between the smuggling and nonsmuggling situations, whereas the presence of smuggling imposes an (additional) terms of trade loss. Thus we can conclude:

For nonprohibitive tariffs, and increasing costs and monopoly in smuggling, smuggling is necessarily inferior to nonsmuggling when smuggling does not eliminate legal trade.

Prohibitive Tariffs

Note, however, that we have explicitly qualified all our propositions by stating them as valid for nonprohibitive tariffs alone. The reason for this is clear enough. When we consider a prohibitive tariff, the nonsmuggling situation is autarkic. Smuggling then
makes trade feasible; the appropriate analogy now is with a trade-creating customs union, as distinct from a trade-diverting customs union, and clearly gains must necessarily accrue from smuggling. We can thus conclude:

For prohibitive tariffs, smuggling is necessarily superior to nonsmuggling, whether smuggling is competitive or monopolistic, and whether subject to constant or increasing costs.

Perfect Competition vs. Monopoly in Smuggling

A comparison between Figures VI and VIII leads directly to the conclusion:

When legal trade and smuggling coexist at nonprohibitive tariffs and increasing costs in smuggling, monopoly in smuggling is better than perfect competition.

In other words, the more smugglers we put in jail, the better! This sounds quite reasonable and proper: economics and morality coincide in their prescriptions! (When legal trade is eliminated, however, monopoly and competition cannot be ranked thus. And at constant costs the two are identical (on our assumptions).) Our result is analogous to the familiar proposition in optimum tariff theory that the exercise of monopoly power by a country improves its welfare. In this instance, the smuggler’s exercise of his monopoly power is tantamount (on our assumptions) to the country’s adopting an optimum tariff policy along the smuggling transformation curve; hence it clearly yields a superior welfare level than if smuggling were competitive.

II. EXOGENOUSLY SPECIFIED OBJECTIVES: TARGET INCREASE IN IMPORTABLE PRODUCTION

The preceding analysis is essentially of interest where the economist thinks either that the tariff policy is misconceived or that it is a historical accident. In either case, the economist is likely to argue — and indeed such arguments are frequently asserted in practice — that smuggling must be welfare-improving, a notion that we have just demonstrated to be unsustainable as a general proposition.

But suppose now that the tariff has been imposed to achieve some definite end. Assume that the government wishes to achieve a prespecified degree of protection for the import-competing industry. We then have the following proposition:

To attain a feasible target increase in domestic production of
the importable good, a tariff with no smuggling is superior to a tariff with smuggling.

This proposition is illustrated in Figure IX. With the production point fixed by the target specification at \( P_s(P_t) \), it follows that \( U_s < U_t \). Again, the rationale of this result can be readily grasped by noting that the fixing of the production point makes the production distortion identical between the smuggling and the nonsmuggling situations, whereas the terms of trade under smuggling are inferior to those under legal trade. Consumption is again at identically distorted prices (at \( C_t \) and \( C_s \) under the nonsmuggling and the smuggling situations, respectively). Hence smuggling must necessarily worsen welfare.

This result is of interest not merely because it reinforces our critique of the customarily complacent view of smuggling, but also because it would seem to us to provide yet another argument in support of the view that, for a production noneconomic objective, a

![Figure IX](image)

Smuggling at Predetermined Production Point

Note that the production of \( X \), the importable good, cannot fall below \( P_s = P_t \). A suitable tariff, in the absence of smuggling, will take welfare to \( U_t \). A higher tariff, in the presence of smuggling (at transformation curve \( P_s, C_s, S \)), would (necessarily) produce lower welfare at \( U_s \). The same result could be illustrated for the case where smuggling does not eliminate legal trade, as also for monopolistic smuggling.
production tax cum subsidy policy is superior to a tariff policy.\(^1\) In the presence of smuggling, the tariff rate needed to encourage domestic import-competing production is clearly greater than if smuggling is not present, and this conclusion is clearly of considerable significance to countries such as Afghanistan and Indonesia, where smuggling assumes significant dimensions.

III. OVERINVOICING AND UNDERINVOICING OF TRANSACTIONS

Our analysis of smuggling can also be readily extended to quasi-smuggling phenomena, such as the overinvoicing and underinvoicing of transactions on legal trade.\(^2\) We demonstrate how this can be done for the case where the presence of a tariff duty leads to underinvoicing of imports.

We should distinguish between two possibilities: (1) where the underinvoicing of imports amounts merely to a de facto reduction in the tariff, so that the smuggling situation is equivalent to a lowering of the tariff; and (2) where the resulting gain to the importer has to be shared, in some degree, with the exporter who collaborates in the faking of the invoices, in which case the effective c.i.f. price of importation to the importing country rises, entailing a terms of trade loss.

Clearly, the latter case is equivalent to our analysis of smuggling, and therefore no modification in our conclusions is necessary. However, in the former case, our conclusions get critically affected. For, with underinvoicing amounting only to a lower tariff, it follows that it must necessarily be superior to a non-underinvoicing situation, and for the case where a target-specified degree of domestic production of the importable must be achieved, it clearly makes no difference now whether there is faking of invoices or not; with faking, the tariff will just have to be set higher, and the faking-inclusive real situation will then be identical with that which would have obtained without faking but with a lower tariff.\(^3\)


3. As with smuggling, however, the degree of protection sought may be unattainable in the presence of faking of invoices.
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IV. Conclusions

We have thus managed to incorporate successfully the phenomena of smuggling and faked invoicing into the welfare analysis of tariffs. Our analysis is clearly generalizable, and in a sequel to this paper we propose to extend our analysis into two major areas: (1) the welfare analysis of domestic taxation, and (2) other propositions in the theory of trade and welfare.4

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4. In particular, our analysis must be extended to a multiple-good model, while the present analysis has explored only the two-good model throughout. Further, we have dealt in the present paper only with the smuggling of goods rather than of “bads” (such as heroin) or of assets (such as gold), whose analysis must be conducted in the framework of differently constructed models. Finally, we may note explicitly that we (correctly, in our view) conceive of smuggling as necessarily taking place in the presence of governmental attempts at enforcing the tariff. (Norman Mintz has pointed out to us that if we were to postulate instead that the government does not do so, the smuggling equilibrium would be identical with the free-trade equilibrium: the real cost of smuggling trade would be no different from that of legal trade in this case because the smugglers would be merely walking past the customs officers, choosing not to pay the tariff and not being penalized for doing so! This situation would be both nonsensical and unrealistic; we have therefore assumed that smuggling necessarily takes place in the context of enforcement.) As with traditional analysis, however, where the cost of operating the tariff is not explicitly taken into account by, say, a shrunk-in production possibility curve, we have simply ignored this aspect of the tariff-enforcement costs.