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Abstract

A potential vehicle to move capital unrecorded out of a country is the misinvoicing of international trade transactions. Exporters may understate the export revenue on their invoices and importers may overstate import expenditures, while their trading partners are instructed to deposit the balance for their benefit in a foreign account. Aiming to quantify the extent of trade mispricing, studies have analyzed asymmetries in matched partner trade statistics or examined price anomalies in transaction level price data. This paper critically reviews these empirical approaches and briefly describes an alternative methodology. Overall, the accuracy and reliability of estimates of illicit financial flows based on trade mispricing are questioned. In particular, it is argued that estimates of trade mispricing are critically dependent on assumptions on how to interpret observed asymmetries in trade statistics. For instance, various reasons for discrepancies in bilateral trade statistics are discussed, and incentives for faking trade invoices other than capital flight are highlighted. Also, aggregate trade data may mask considerable variation in trade discrepancies at the transaction level. Most notably, the importance of trade mispricing as a method for the unrecorded cross-border transfer of capital is generally unclear.

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1. Introduction

The (in-)accuracy of international trade statistics has recently (once more) become an issue of much debate. Trade data are often critically reviewed (more than other economic statistics) for at least three reasons. First, data on international trade are of considerable economic relevance. Cross-border shipments of goods and services often have sizable effects on a country's economic activity. Also, for some countries, taxes on international trade constitute a sizable share of government revenue. Second, a country's trade data allow, in principle, for full cross-check with data from other countries. Individual trade transactions are recorded separately by both trading partners so that it should be quite easy to compare these records. As Naya and Morgan (1974, p. 124) note: "Comparable double accounts are not usually available for domestic economic transactions." Finally, recent research has re-emphasized that trade activities are subject to criminal behavior. Fisman and Wei (2009) show that smuggling of cultural property is related to the level of corruption in the country of origin. Baldwin (2006) discusses the effect of value-added tax (VAT) fraud on intra-European trade figures.

A feature of international trade statistics that has frequently attracted considerable attention is the potential asymmetry in partner country trade statistics due to mispricing. More specifically, it has been argued that the faking of trade invoices is a commonly used method to move money out of developing countries. When trade declarations are manipulated such that the stated value of imports exceeds their actual value (overinvoicing) and/or the stated value of exports is below their actual value (underinvoicing), financial resources are implicitly transferred abroad without any official record being made. Conversely, it is assumed that in order to proxy for such illicit financial flows (often labelled 'capital flight'), trade statistics may provide some useful empirical indication. For instance, Kar and Cartwright-Smith (2008) explore gaps in mirror trade statistics; see Bhagwati, Krueger and (1974) for an early contribution. De Boyrie, Pak and Zdanowicz (2004) examine the variation of trade prices at transaction level.

This paper provides a detailed discussion of issues associated with trade mispricing. The paper reviews various incentives for faking trade invoices, critically examines empirical approaches to quantify the extent of mispricing (thereby also highlighting other potential reasons for discrepancies in bilateral trade statistics), and analyzes differences in mirror trade statistics at the product level (which are possibly associated with mispricing behavior). It also assesses how trade mispricing may be reflected in capital flight and illicit flows estimates.

The plan of the paper is as follows. In the first section, I review evidence on asymmetries in international trade statistics. Illicit financial flows are typically generated by underinvoicing exports and overinvoicing imports. However, dozens of other reasons for over- and underinvoicing of trade activities have been identified in the literature; these reasons include, among others, overinvoicing of exports to benefit from export subsidies and underinvoicing of imports to avoid payment of import tariffs. As a result, some of these misinvoicing activities may offset each other. In addition, there are other reasons for incorrect trade invoices and thus discrepancies in official trade figures. These manipulations may be the result of intended (criminal) behavior such as smuggling or carousel fraud (explained below). Similarly, however, they could simply reflect inaccuracies in compiling trade figures (e.g., due to the Rotterdam effect) and thus result from unintended behavior.

Based on the discussion of incentives for misreporting trade flows, empirical approaches to quantify the extent of mispricing are analyzed. The DOTS approach in Kar and Cartwright-Smith (2008) and the work by Pak and Zdanowicz are critically reviewed.

Finally, the paper examines how trade mispricing fits into the illicit flows estimates. Kar and Cartwright-Smith (2008) use the gap in trade statistics (along with other approaches) to provide detailed estimates of illicit financial flows by country. This section examines the robustness of their findings. For instance, results are compared to estimates derived from the product level approach of Fisman and Wei (2009). Similarly, it may be useful to relate their estimates of illicit flows to other country characteristics which have been found to be associated with trade mispricing such as corruption.

2. Discrepancies in Trade Statistics

Conceptually, country i's exports to country j are equivalent to j's imports from i. In practice, however, recorded trade figures in official matched partner country trade statistics differ. The reasons for asymmetries in trade statistics are manifold; they can be broadly grouped into two categories: legitimate statistical reasons and intended misdeclaration. For illustration, I briefly summarize some of the main explanations for the discrepancy in officially reported exports and imports figures. Morgenstern (1950), in a classical paper, provides a more detailed account.

2.1 Statistical Reasons

The most notable source of discrepancy between the exports of one country and the imports of the other is the conceptual difference in valuation. Exporting countries report the value of goods at the initial point of departure (f.o.b.), while import values refer to the value at the point of final destination, thereby including the costs of freight and insurance (c.i.f.).[1] As a result, the c.i.f./f.o.b. ratio has been frequently used in the literature as a measure of transportation costs. Limão and Venables (2001) provide a recent application of this approach; see Hummels and Lugovskyy (2006) for a detailed critique.

Apart from the different treatment of shipping costs, there are other methodological difficulties when exploring matched partner trade statistics. For instance, the correct identification of the source or destination country might be a problem. When the country of final destination is not known at the time of exportation, the exporter declares the country of last shipment; the country of final destination, in contrast, classifies its imports by country of origin. Herrigan, Kochen and Williams (2005, p. 9) provide an illustration of this 'Rotterdam effect' in trade statistics. They note (p. 9) that "crude oil is imported from the UK via Portland, Maine in the USA, and then sent by pipeline to Canada. This is recorded in Canada as an import from the UK, whereas the UK records an export to the USA. The USA do not record either flow, as it is simple transit. Thus the UK records more oil exports to the USA then they record importing, and recorded less oil exports to Canada then they record importing."

Another potential issue of importance is timing. Since there are often notable time lags between the departure and arrival of a shipment (e.g., due to long-distance sea cargo, a delay in customs declaration or temporary storage in a warehouse), trade could be recorded in different calendar years. More importantly, statistical offices in the source and destination country may value goods at different prices and/or exchange rates. Finally, recorded trade at the commodity level may differ due to the omission of individual transactions in one of the partner countries (e.g., because of varying thresholds for low value trade across countries), the exclusion of certain product groups in a country's trade statistics (such as military material or repair trade) or differences in commodity classification (e.g., a regrouping of a transaction into chapter 99, which covers items not elsewhere classified, for reasons of confidentiality).

2.2 Fraudulent Trade Activities

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[1] This difference is based on agreed guidelines for international trade statistics as published by the United Nations International Merchandise Trade Statistics: Concepts and Definitions. Some countries, however, also report imports on f.o.b. basis (e.g., Australia).

Discrepancies in trade statistics may also result from intended misdeclaration of trade activities. Transactions may be hidden completely (so that official statistics underreport trade), mispriced in trade invoices (with a priori unknown effects on trade statistics), or purely imaginary (so that trade is overstated in the data).

Unreported Trade

In order for unreported trade activities (i.e., smuggling) to affect asymmetries in partner country trade statistics, the transactions have to be recorded by one of the partners. This is the set-up that Fisman and Wei (2009) have in mind. For antiques and cultural property, there are often strong export restrictions such that there is an incentive to smuggle the goods unrecorded out of the country. Imports, however, are properly declared since there are generally no constraints for entry of such goods, and there is even the risk of seizure when there is false declaration.

Fictitious Trade

An example of imaginary trade transactions (where official trade figures are artificially inflated) is missing trader VAT fraud in intra-European Union trade. For intra-Community trade, for which no barriers to trade exist and, thus, there are no customs declarations, trade statistics rely on the VAT system; that is, firms declare to fiscal authorities, as part of the VAT return, trade activities with customers and suppliers in European Union member countries. Trade statistics are then affected by two types of VAT fraud. In acquisition fraud, goods are regularly imported VAT free and then sold on the home market (e.g., to the next trader) at a price including VAT. Instead of paying over the VAT to tax authorities, however, the importer disappears. As a result, because of the missing VAT declaration, imports also remain unrecorded. A more elaborate version of this form of criminal attack on the VAT system is carousel fraud where, after a series of sales through home companies, the imported goods are re-exported again to the country of origin (or any other EU member country) and, thus, move in a circular pattern. Again, "exports" are properly declared, while "imports" are not captured in trade data which may lead to substantial asymmetries in partner country trade statistics. When in 2003 the United Kingdom's Office for National Statistics made corrections to trade figures for VAT fraud, real GDP growth for previous years was lowered by up to 0.2 percentage points.[2]

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[2] See http://www.statistics.gov.uk/pdfdir/qnabrief0903.pdf. Ruffles, Tily, Caplan and Tudor (2003) provide a more detailed description.

Misreported Trade

Finally, trade may be recorded but invoices are faked such that the declared value of a trade transaction deviates from its true value. A plausible explanation for trade mispricing is capital flight. When there are exchange restrictions, overinvoicing of imports and underinvoicing of exports is a popular method for the unrecorded moving of capital out of the country. However, there are other reasonable explanations for mispricing. Some of these explanations work in a similar direction. For instance, underreporting of exports allows firms to acquire foreign exchange that is not disclosed to national authorities; the foreign currency can then be freely used by exporters without complying with any controls and regulations (e.g., a potential option may be the sale of foreign currency in the parallel exchange rate market). Further, authorities may use information on firms' export activities to infer their production. As a result, firms that seek to hide output (e.g., to evade domestic taxes) will automatically also seek to hide exports. Dabla-Norris, Gradstein and Inchauste (2008) provide a description of informal activities by firms.

Others work in the opposite direction. For instance, when there are import restrictions, there is an incentive to underinvoice imports; misdeclaration of cargo is an obvious solution to circumvent these trade restrictions. Bhagwati (1964) provides an early empirical assessment of such activities. Similarly, to benefit from export subsidies, exports can be overinvoiced. Celasun and Rodrik (1989) argue that a sizable share of the increase in Turkish exports after 1980 is due to a change in invoicing practices of domestic entrepreneurs (in order to take advantage of generous export subsidies).

2.3 Summary

The finding that official trade statistics may suffer from misreporting and faked declarations is a well-known fact, not only to statisticians of international trade. Bhagwati (1964, 1967) provides an early economic discussion of incentives for misinvoicing in trade; Bhagwati and Hansen (1973) develop a trade model to examine the welfare effects of smuggling.

Using trade statistics in turn to quantify the extent of misreporting, however, appears to be difficult. For one thing, misreporting can work in either direction so that some activities may offset each other in aggregate trade statistics. Also, the extent to which transactions are reported at all (and thus show up in the trade statistics of at least one of the trade partners) may vary. Measures of increased surveillance of trade transactions have apparently little

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measurable effect.[3] Finally, discrepancies in trade statistics may simply arise from statistical factors. A quantitative assessment of such factors in a bilateral context has been provided for trade flows between Australia and the European Union, for which reported trade figures differ on average by about 10% between the two trade partners. Table 1 summarizes the results. As shown, the largest source of discrepancy between recorded exports and imports is the difference in (c.i.f./f.o.b.) valuation which inflates European import data by on average about 9%. In contrast, goods which are imported by Australia and are subsequently re-exported to the European Union may have initially artificially lowered the discrepancy (since they are recorded in Australia's exports but not in the European Union's imports). In view of all these difficulties, the European Union, though aiming to reduce the declaration burden on businesses, still refrains from using mirror (single-flow) trade statistics.[4]

3. Trade Mispricing and Illicit Financial Flows

Illicit financial flows are, by definition, unobservable in official statistics. However, based on the assumption that trade mispricing is an important method for the unrecorded moving of capital out of the country, a number of papers have examined data from trade statistics to provide some rough empirical indication about the magnitude of such illicit financial flows. In the following, I discuss two of these approaches in detail: the analysis of asymmetries in trade statistics, and the analysis of price anomalies in transaction-level trade data.

3.1 Conceptual Issues

Before I proceed, it may be useful to briefly address some conceptual issues on the definition of illicit financial flows. When describing capital flows, often very different concepts are applied to classify capital transactions. For instance, as noted in the IMF's (1992, p. 89) Final Report of the Working Party on the Measurement of International Capital Flows, there is an occasional tendency to identify any capital outflow from a country as 'capital flight'. Kar and Cartwright-Smith (2008) appear to follow this (broadest possible) approach

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[3] Winston (1974, p. 64) argues: "[R]egardless of the sincerity of efforts, it is virtually impossible to control overinvoicing considering the myriad ways it can, in fact, be done."
[4] For an early attempt, see the European Commission's "Simpler Legislation for the Internal Market (SLIM)" initiative, which is documented at http://ec.europa.eu/internal_market/simplification/index_en.htm.

for capital outflows from developing countries; they argue (p. iii): "The term flight capital is most commonly applied in reference to money that shifts out of developing countries, usually into western economies."

While this approach may be applicable, a possible shortcoming of this very general definition is that it also covers all standard (or 'normal') cross-border capital transactions. Therefore, a number of authors prefer taking a more restrictive approach that includes only a subset of capital movements and also justifies the negative connotation ('capital flight'). Walter (1987), for instance, emphasizes the importance of motivations for flight (such as macroeconomic mismanagement or fear of confiscation) by arguing that "capital flight is capital that flees". Cumby and Levich (1987) focus on the type of transaction by excluding "all freely organized legal transactions" from their definition of capital flight. In summary, it might seem reasonable to distinguish capital transactions along various dimensions, such as the source of capital, the method of transfer and/or the motivation for the transaction.

A similar reasoning may also apply to the definition of illicit financial flows. Again, Kar and Cartwright-Smith (2008) provide a very comprehensive approach, treating all unrecorded capital transfers as illegal and note, more generally, that (p. iv) "illicit money is money that is illegally earned, transferred, or utilized".[5] Another plausible definition, by contrast, also takes into account the motivation for such behavior. Illicit financial flows may then be defined as any capital transaction that intentionally moves capital unrecordedly out of a country, with trade mispricing being one of (potentially many) possible conduits for such conduct.[6]

3.2 Examining Asymmetries in Trade Data

A prominent approach to quantifying the extent of misinvoicing is the analysis of matched partner country trade statistics. Based on the principle of double counting in trade statistics, a country's exports to a partner are compared to what the partner reports as having imported ('mirror statistics'). The difference may then provide a reasonable indication of illicit flows that occur through mispricing. A recent application of this approach is Kar and Cartwright-Smith (2008); an early contribution is Bhagwati, Krueger and Wibulswasdi (1974).

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[5] Kar and Cartwright-Smith (2008, p. iii) argue that "by far the greater part of unrecorded flows are indeed illicit, violating the national criminal and civil codes, tax laws, customs regulations, VAT assessments, exchange control requirements and banking regulations of the countries out of which unrecorded/illicit flows occur".

[6] For instance, for some transactions, avoidance of trade taxes rather than capital transfer may be the primary motivation.

Trade Asymmetries ≠ Mispricing

Any estimate of illicit financial flows derived from asymmetries in trade statistics has to deal explicitly with three types of problems. The most notable issue is related to the accuracy of trade statistics in general. As noted before, partner country trade data typically differ for various reasons. As a result, trade figures have to be adjusted before any possibly remaining statistical asymmetry can be reasonably interpreted as being due to mispricing. At a minimum, trade data have to be corrected for differences in valuation which is most likely to be the main reason for a discrepancy in mirror statistics. However, information on transportation costs which are needed for the conversion from f.o.b. to c.i.f. values are rare; it is for precisely this reason that some trade economists have used the c.i.f./f.o.b. ratio as a proxy for transportation costs.[7]

To deal with this issue when seeking to identify mispricing, two approaches have been frequently applied in the literature. First, the analysis may focus particularly on episodes in which f.o.b. export values exceed the corresponding c.i.f. import values. Since the latter includes additional price components (transportation costs) and, therefore, should, by definition, be larger than the former, such 'perverse' statistical findings may indicate that mispricing has occurred; this argument has been first made in an empirical analysis of underinvoicing of imports in Bhagwati (1964). Capital outflows through trade mispricing, however, work exactly in the opposite direction; these activities are associated with overinvoicing of imports and underinvoicing of exports which tend to inflate the observed difference between c.i.f. and f.o.b. values so that this approach is of little help.

Second, a number of papers apply a flat c.i.f./f.o.b. conversion factor. Typically, with reference to conventions by international organizations, a 10 percent difference between c.i.f. and f.o.b. values is assumed. For instance, when using partner data to supplement their trade database, the International Monetary Fund generally applies a c.i.f./f.o.b. factor of 1.1; see http://www.imfstatistics.org/dot/DOTEstim.htm. Any discrepancy in mirror statistics that exceeds this correction might then be attributed to mispricing; see, for instance, Bhagwati, Krueger and Wibulswasdi (1974). However, this approach provides, at best, only a very crude empirical indication for the potential presence of misinvoicing since the assumption of a fixed conversion factor that varies neither over time nor among trading partners is clearly challenging.

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[7] For an early critical assessment of this approach, see Moneta (1959).

Mispricing ≠ Illicit Flows

To the extent that discrepancies in trade statistics indeed reflect mispricing, over- and underinvoicing of trade transactions may be completely unrelated to illicit financial flows (narrowly defined). An obvious reason to underinvoice trade is to avoid payment of trade taxes; similarly, overinvoicing allows benefiting from trade subsidies. More specifically, when export duties are ad valorem, the motive to reduce the effective tax rate by underinvoicing exports is indistinguishable from a flight-motivated capital outflow in the analysis of mirror statistics in international trade. In similar fashion, overinvoicing of imports (for other reasons than capital flight) may occur when a firm seeks to reduce its before-tax profits (and hence the effective tax on profits) by overstating the cost of imported inputs. As a result, an assumption has to be made to what extent trade mispricing is indeed a channel for illicit flows.

Illicit Flows ≠ Trade Asymmetries

Conversely, it is questionable to what extent illicit flows are indeed detectable from asymmetries in aggregate trade data. Various incentives for faking trade invoices that work exactly in the opposite direction than the capital flight motives can be identified. The effects of these explanations on trade (that is, underinvoicing of imports and overinvoicing of exports) have been widely documented. For instance, Celasun and Rodrik (1989, p. 723) note that the introduction of export subsidies in Turkey in the early 1980s has led to substantial overinvoicing. "Turkish entrepreneurs, never too shy in exploiting arbitrage opportunities, used the wedge [between the profitability of manufactures exports and the profitability of other means of earning foreign exchange] to their advantage." Celasun and Rodrik conclude (p. 729-730): "Once fictitious exports are eliminated, the average growth rate of Turkish exports … is not nearly as spectacular as [that] … calculated from official statistics." The existence of obvious incentives for underinvoicing of imports has been recently documented empirically in Yang (2008). Yang examines an increase in enforcement in Philippine customs that targets a specific method of avoiding import duties. He nicely illustrates that increased enforcement (by lowering the minimum value threshold for pre-shipment customs inspection for shipments from a subset of origin countries) reduced the targeted duty-avoidance method, but caused substantial displacement to an alternative method (shipping via duty-exempt export processing zones).

In sum, there are various motives for mispricing in trade invoices. Table 2 lists some of these motives; see also Dornbusch and Kuenzler (1993, p. 110). As these effects partly

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work in opposite directions, they may easily cancel each other out at the aggregate trade level. For instance, when a shipment is underinvoiced in the exporting country in order to move unrecorded capital out of the country, and the shipment carries the same mispriced invoice in the importing country in order to evade import tariffs, no discrepancy in mirror trade statistics will occur.[8] Reviewing the various motives, Bhagwati, Krueger and Wibulswasdi (1974) argue that underinvoicing of exports, rather than overinvoicing of imports, is more often used as a vehicle of capital flight, also because export controls are less restrictive. Gulati (1987) even finds that, when faking trade invoices, underinvoicing of imports more than outweighs underinvoicing of exports so that for a number of countries (illicit) capital inflows are observed.

Kar and Cartwright-Smith (2008)

In view of these difficulties, it is interesting to review recent estimates of capital flight due to trade mispricing provided by Kar and Cartwright-Smith (2008).[9] These authors analyze international trade statistics, address the above-mentioned relevant issues in a consistent and transparent way, and estimate, based on this analysis, the volume and pattern of illicit financial flows. While their efforts have provoked useful debate, it should also be clear, however, that the reliability of the estimates crucially hinges on the assumptions made and conventions chosen.

A first set of methodological issues in Kar and Cartwright-Smith (2008) relates to the interpretation of observed asymmetries in matched partner trade statistics. As noted before, trade asymmetries may arise for a variety of reasons and, therefore, do not necessarily reflect trade mispricing. Kar and Cartwright-Smith (2008) acknowledge the difficulty in properly identifying mispricing from trade data by providing a definition for trade asymmetries of interest. Specifically, after a careful discussion of the limitations of various models in estimating illicit flows, they provide two sets of estimates of trade mispricing by country. In their baseline model, they apply a 'gross excluding reversals (GER)' method. This method is based on the assumption that episodes of bilateral export underinvoicing and import overinvoicing reflect capital outflows, while they argue that episodes of pair-wise trade gaps

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[8] A more fundamental issue is that illicit flows through trade mispricing may not necessarily show up in trade invoices (e.g., when there are inofficial agreements).

[9] Kar and Cartwright-Smith (2008) also apply other methods (such as the World Bank residual model) to derive estimates of illicit financial flows. Since one term in the computation of the World Bank residual is the current account balance which may be distorted downward by trade mispricing, both results are added to obtain an aggregate estimate.

in the opposite direction (possibly representing capital inflows) are spurious due to data issues (and therefore simply set to zero). As a result, when a country reports low export figures relative to recorded imports in the corresponding partner country, this discrepancy is defined, according to Kar and Cartwright-Smith (2008), as mispricing. In contrast, a statistical discrepancy similar in magnitude that results from the same country's relatively large exports vis-à-vis another partner's imports is, by definition, ignored. This selective interpretation of trade asymmetries appears to artificially inflate estimates of illicit financial flows. Indeed, when offsetting capital flows are additionally taken into account, a country's 'net' position is obtained, which is often sizably lower than the estimated GER result. With this extension, many aggregate country estimates even change signs. However, Kar and Cartwright-Smith (2008) argue that the results derived from this method are distorted and 'unrealistic' and focus instead on the GER approach.

Kar and Cartwright-Smith's (2008) interpretation becomes particularly troublesome when the treatment of transportation costs in their analysis is also taken into consideration. A major source of discrepancy between exports and corresponding imports is the difference in valuation concepts so that c.i.f. imports must be converted to f.o.b. values. Kar and Cartwright-Smith (2008) apply a c.i.f./f.o.b. conversion factor that is fixed (at 1.1) across all bilateral country pairs (irrespective of trade distance and the commodity composition of trade) and over time. In practice, however, c.i.f./f.o.b. ratios in international trade statistics often lie outside a reasonable range of variation. According to Hummels and Lugovskyy (2006), roughly half of all observations in the IMF's Direction of Trade Statistics database lie outside a (1,2) range (which would be consistent with ad valorem transportation costs between 0% and 100%); the remaining observations contain substantial errors in levels. Still, Kar and Cartwright-Smith (2008) classify, after a flat 1.1 correction, any c.i.f./f.o.b. ratio larger than one as evidence of trade mispricing, while ratios below this threshold (often covering substantial fractions of trade) are treated as noise.[10]

Another set of issues refers to the difficulty of identifying mispricing and estimating illicit financial flows from aggregate trade data. Mispricing occurs at the level of the individual trade transaction, whereas Kar and Cartwright-Smith (2008) examine trade asymmetries at the country level. Their focus on aggregate trade, however, is likely to produce inconsistent results. Assume, for instance, that trade gaps at the commodity level cancel each other out at the aggregate level; these trade gaps remain uncaptured in Kar and

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[10] Hummels and Lugovskyy (2006) note that for the United States and New Zealand episodes in which f.o.b. exports exceed corresponding c.i.f. imports constitute about one-third of the IMF data.

Cartwright-Smith (2008), potentially leading to aggregation bias. More realistically, when trade gaps are concentrated in a few product categories with serious difficulties in properly reporting trade flows (e.g., crude oil), the resulting trade asymmetries at the country level are taken as evidence of trade mispricing (and, thus, illicit financial flows).

Moreover, any pooled estimate of asymmetries in aggregate trade data may mask considerable variation in export and import behavior. Therefore, when computing trade gaps for a large set of countries, it appears particularly helpful to distinguish between, and report results separately for, underinvoicing of exports and overinvoicing of imports. In principle, there should be no difference between the two methods: both activities involve faking of trade declarations, and both activities may be instruments to facilitate illicit capital flows. In practice, however, there are typically large differences in the observed degrees of export underinvoicing and import overinvoicing; see, for instance, Gulati (1987). Bhagwati, Krueger and Wibulswasdi (1974) argue that especially the incentive to overinvoice imports, as a vehicle of capital flight, is often overcome by other motives to fake trade invoices. As a result, there is an asymmetry of conduit-behavior for illicit financial flows which should be documented in empirical findings to aid proper interpretation of the results.

3.3 Examining Transaction-Level Price Data

In a series of papers, Simon Pak and John Zdanowicz analyze price data in transaction-level trade statistics. In a typical analysis, such as de Boyrie, Pak and Zdanowicz (2005), the authors examine information from individual export declarations and entry forms in U.S. external trade. The data set is huge; it contains about two million records per year.[11] Specifically, Pak and Zdanowicz are interested in the product code, the partner country involved in the trade, and the price quoted in the trade document. With this set of information, it is possible to analyze, for each product-country pair, the range of prices recorded in trade transactions. More notably, based on this price range, transactions with 'abnormal' prices can be identified; Pak and Zdanowicz define prices that fall outside the interquartile range as 'abnormal'. These improperly priced transactions are then assumed to constitute illegal capital flows, with the capital outflow being determined by the dollar value of over- or underinvoicing of a transaction based on its deviation from interquartile prices.

What is a Product?

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[11] The data are obtained from the U.S. Merchandise Trade Database.

Although Pak and Zdanowicz's idea of using micro-level trade data is generally intuitive, their approach is not without difficulties. An obvious issue is the definition of a product. Pak and Zdanowicz rely on the harmonized classification of products in international trade statistics. At the most detailed level (for U.S. external trade), this commodity code system contains about 20,000 product categories. It is unknown, however, whether these products are indeed homogeneous; there may be considerable differences in product characteristics (such as quality) and, thus, in product prices within categories. As a result, the price range within a category may be wide so that mispriced transactions remain undetected. Alternatively, a transaction may be mistakenly identified as improperly priced when most transactions within a category are in low-value products, while a single transaction is in an expensive high-quality product.

The relevance of product definitions has been recently highlighted by Javorcik and Narciso (2008). Javorcik and Narciso argue that there is broader scope for faking invoices in differentiated products because it is difficult to assess the quality and thus the price of such products. Examining trade gaps in mirror trade statistics for German exports to 10 Eastern European countries, they find that the responsiveness of the trade gap to the level of tariffs is greater for differentiated products than for homogeneous goods.

In addition, it should be mentioned that the product categories are defined for customs purposes. This implies, for instance, that some products are properly and tightly defined, while there are plenty of product codes that simply collect all other types of products. For illustration, consider the description of the 2009 harmonized tariff schedule, available online at http://www.usitc.gov/tata/hts/index.htm. The tariff schedule lists 28,985 product categories (including sub-headings) of which about one-half (12,581 categories) contain the catch-all phrase 'other' in their description. Examples are given in Table 3. As shown, the first category of heading 4901 covers printed material in single sheets; this material is categorized into "reproduction proofs" and all "other" single-sheet material – the other single-sheet material may range from plain black-and-white leaflets to expensive art prints on special paper without any further qualification in the customs statistics. The category "art books" is divided into sub-categories by price: less than 5 dollars or more than 5 dollars for each book. However, it is obvious that art books that cost more than 5 dollars may still vary considerably in style, format and quality (and therefore also price). Finally, the unit of quantity for "tankers" is the number of ships; differences in size and equipment of such ships may imply considerable price differences per unit.

Abnormal Prices

Another challenge for the Pak and Zdanowicz approach is the arbitrary definition of abnormal prices.[12] The focus on the interquartile price range appears to be taken from U.S. legal regulations for detecting transfer pricing manipulation in trade between related parties. However, there is no economic reason to describe prices above or below a certain threshold level a priori as 'abnormal'. In fact, even for products with minor variations in prices, the method may, under specific circumstances, identify improper pricing.

More importantly, any analysis that is based on the distribution of prices appears to be sensitive to the number of observations. For example, transactions for products for which a similar range of traded prices is observed may be classified as 'normal' or 'abnormal' pricing, depending on the number of trade transactions. Alternatively, the occurrence of an additional data point may lead to a reclassification of a transaction from 'normal' to 'abnormal' pricing and vice versa. In general, the distribution of prices should become more representative the more price observations are available. For many products, however, there are typically only very few bilateral trade transactions.

Price Variations over Time

With the mechanical classification of prices above or below a certain threshold as faked, the results are potentially difficult to interpret. Variation of prices at the transaction level may arise for various reasons. These reasons may be trivial such as mistakes in filling the form. However, there may be also differences in prices across markets (both internationally and within the U.S.). Also, when the variation of prices over a longer time horizon is analyzed, transaction dates may matter. For instance, seasonality may lead to considerable price fluctuations.[13]

Quantity Faking

An issue that remains untouched by the Pak and Zdanowicz approach is misinvoicing of quantities. Instead of faking prices or unit values, the invoice is faked by misstating the quantity being shipped; that is, the container contains a different quantity than invoiced. Although perhaps more detectable than unit value faking, Bhagwati (1981, p. 417) notes that

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[12] See also the discussion in Fuest and Riedel (2011).

[13] Gopinath and Rigobon (2008) examine monthly price data for approximately 20,000 imported goods and find that the (trade-weighted) median price duration in the currency of pricing is 10.6 months.

this is a "rather common form of illegality". In addition, there are other ways of misinvoicing, including, for instance, the omission of invoiced spare parts.

Trade Pairs

Since Pak and Zdanowicz's results are exclusively based on data from U.S. customs, it is unclear to what extent their results can be generalized. Anecdotal evidence suggests that faking of trade invoices occurs especially in trade with a main trading partner which is not necessarily the United States. For instance, Celasun and Rodrik (1989) find strong evidence of misreporting only in Turkey's trade with Germany. For African countries, trade with South Africa, the regional economic and financial center, may be the preferred target for misdeclaration.

4. Trade Asymmetries: An Empirical Analysis[14]

For illustration, I briefly examine trade asymmetries at the commodity level. In this empirical exercise, I use the United Nations Comtrade database to obtain exports and imports data at the 4-digit (HS) product level. The database contains detailed (annual) trade statistics reported by statistical authorities of close to 200 countries or territories and standardized by the UN Statistics Division; I examine the records of shipments to the five largest importing nations in the world (United States, Germany, China, United Kingdom and Japan). At the 4-digit level, there are more than 1,200 product categories. I use the most recent commodity classification (HS-2002); the data are available for five years, covering the period from 2002 to 2006.

I begin by exploring the full sample of annual country pair-specific trade gaps at the 4-digit product level. That is, I compute, for each country pair and product, the percentage difference between reported imports and corresponding exports. Table 4 lists the five largest discrepancies in bilateral trade by importer along with the exporter and the 4-digit product code. Interestingly, a few empirical regularities emerge from this rough tabulation. For instance, most experiences where recorded import values strongly exceed corresponding exports appear to be concentrated in one single product category, 'petroleum oils, crude' (HS code 2709). As Yeats (1978) notes, this discrepancy is often due to problems in valuing petroleum, and the frequent diversion of petroleum exports from its original destination en

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[14] This section draws on Berger and Nitsch (2012).

route. For other product categories, in contrast, export values (despite disregarding transportation costs) are considerably larger than imports in mirror statistics; these categories include 'other aircraft (for example, helicopters, aeroplanes), spacecraft' (8802), 'cruise ships, excursion boats, ferry-boats, cargo ships, barges and similar vessels for the transport of persons or goods' (8901) and 'gold (including gold plated with platinum)' (7108). A possible explanation is that, especially for bulky items with low-frequency trading, the time lag between exportation and importation may be of particular importance. Also, to the extent that there is any geographical pattern in misreporting, over-invoicing of exports appears to be a more frequent problem in trade with neighboring countries.

To further analyze the geographical pattern in misreporting, I examine differences in trade gaps across countries in more detail. In particular, I aim to identify countries that consistently understate their exports (and, thus, appear to be particularly prone to trade mispricing or smuggling). In a first exercise, I compute for each exporter the average trade gap across all products. Since there may be sizable product-specific differences in reported trade values between the exporting and the importing country, taking the arithmetic mean of these reporting gaps over often hundreds of products is a simple way to (hopefully) identify country-specific differences in trade reporting. Table 5 lists the five countries with the largest average percentage share of missing exports by importer. As shown, I find indeed a strong and consistent mismatch in international trade statistics, with continuous underreporting, for instance, by Equatorial Guinea, Indonesia and the Philippines. More importantly, reviewing the full distribution of exporting countries, it turns out that the extent to which countries tend to misreport exports is broadly similar across trade destinations. The correlation of exporter-specific average trade gaps across importing countries is astonishingly high, on the order of about 0.9. Table 6 reports a set of simple bivariate correlation coefficients; (unreported) Spearman rank correlations provide similar results. These consistent patterns of misreporting in trade appear to provide a useful basis for further research.

In Berger and Nitsch (2012), for instance, we use regression analysis to examine the association between observed trade gaps and country-specific corruption levels. Holding constant a variety of other determinants of discrepancies in trade statistics, we find that the reporting gap in bilateral trade is indeed strongly associated with the level of corruption, especially in the source country. In countries with corrupt bureaucracies, it seems easier (and perhaps even common practice) to ignore legal rules and procedures. To the extent that this misbehaviour also affects international trade transactions, our findings suggest that reporting

gaps in official trade statistics partly reflect illegal activities for which the illicit movement of capital may be one motivation.

5. Conclusion

A potential vehicle to move capital unrecorded out of a country is the misinvoicing of international trade transactions. Exporters may understate the export revenue on their invoices and importers may overstate import expenditures, while their trading partners are instructed to deposit the balance for their benefit in a foreign account.

This paper critically reviews empirical approaches to quantify the extent of trade mispricing. There are at least two sorts of problems. For one thing, mispricing behavior is hard to identify. The analysis of discrepancies in bilateral trade statistics appears to be of generally limited value since gaps in trade statistics also typically arise for reasons unrelated to mispricing. Another set of issues refers to motivations for fraudulent trade behavior. Even if mispricing is properly identified, there are incentives for faking trade invoices other than the transfer of capital.

Overall, the accuracy and reliability of estimates of illicit financial flows based on trade mispricing are questioned. This finding is in line with Bhagwati (1967) who argues: "Whereas it is easy to establish the conditions under which the faking of trade values […] will occur, it is in practice extremely difficult to set about determining whether such faking is actually occurring. It is further impossible to find out how much faking is going on."

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Table 1: Asymmetries in Australia-EU Trade: A Statistical Practitioner's Assessment

	1992	1993	1994	1995	1996	1997
Australian exports (f.o.b.)	7711	7476	7247	8007	8381	8678
Adjustments						
Country classification						
Australian re-exports	-400	-417	-327	-451	-394	-333
EU indirect imports	101	133	120	137	242	185
EU re-imports	215	195	240	245	275	315
Exchange rate	-25	-4	7	-1	1	-28
Ships	80	--	--	--	--	--
Adjusted Australian exports	7682	7383	7286	7937	8504	8815
EU imports (c.i.f.)	8721	7159	7979	8813	8526	9570
Adjustments						
Valuation	-728	-605	-658	-737	-708	-795
Timing	-93	25	81	54	62	23
Exchange rate	-41	13	-7	--	-6	-15
Ships	--	--	--	--	236	--
Non monetary gold	63	484	126	-4	119	
Adjusted EU imports	7922	7077	7520	8124	8228	8782
Discrepancy						
Unadjusted	1010	-316	732	806	145	892
%	*13*	*-4*	*10*	*10*	*2*	*10*
Adjusted	240	-306	235	187	-276	-34
%	*3*	*-4*	*3*	*2*	*-3*	*--*

Notes: All figures (except those in italics) in millions of Australian dollars.

Source: Australian Bureau of Statistics (1998)

Table 2: Motives for Mispricing in International Trade

	Overinvoicing	Underinvoicing
Exports	Capturing export subsidies	Capital flight Avoiding export taxes
Imports	Capital flight Lowering domestic profits	Evading import duties

Source: Adapted from Dornbusch and Kuenzler (1993).

Table 3: Examples of Product Categories in the Tariff Schedule

4901   Printed books, brochures, leaflets and similar printed matter, whether or not in single sheets:
4901.10.00   In single sheets, whether or not folded
4901.10.00.20 Reproduction proofs
4901.10.00.40 Other
Other:
4901.91.00   Dictionaries and encyclopedias, and serial installments thereof
4901.91.00.20 Dictionaries (including thesauruses)
4901.91.00.40 Encyclopedias
4901.99.00   Other
4901.99.00.10 Textbooks
4901.99.00.20 Bound newspapers, journals and periodicals provided for in Legal Note 3 to this chapter
4901.99.00.30 Directories
Other:
4901.99.00.40 Bibles, testaments, prayer books and other religious books
4901.99.00.50 Technical, scientific and professional books
Art and pictorial books:
4901.99.00.60 Valued under $5 each
4901.99.00.65 Valued $5 or more each
Other:
4901.99.00.70 Hardbound books
4901.99.00.75 Rack size paperbound books
Other:
4901.99.00.91 Containing not more than 4 pages each (excluding covers)
4901.99.00.92 Containing 5 or more pages each, but not more than 48 pages each (excluding covers)
4901.99.00.93 Containing 49 or more pages each (excluding covers)

8901   Cruise ships, excursion boats, ferry boats, cargo ships, barges and similar vessels for the transport of persons or goods:
8901.10.00 00 Cruise ships, excursion boats and similar vessels principally designed for the transport of persons; ferry boats of all kinds
8901.20.00 00 Tankers
8901.30.00 00 Refrigerated vessels, other than those of subheading 8901.20
8901.90.00 00 Other vessels for the transport of goods and other vessels for the transport of both persons and goods

Table 4: Largest trade gaps, 2004

Underreporting of exports

Importer:														
USA			Germany			China			United Kingdom			Japan		
Exp.	Prod.	Gap	Exp.	Prod.	Gap	Exp.	Prod.	Gap	Exp.	Prod.	Gap	Exp.	Prod.	Gap
SAU	2709	23.8	LBY	2709	22.0	PHL	8542	22.4	BWA	7102	21.5	SAU	2709	23.4
VEN	2709	23.7	GBR	8803	21.2	AGO	2709	22.3	SAU	2710	20.6	QAT	2709	22.4
NGA	2709	23.5	DNK	9999	21.2	SAU	2709	22.3	KWT	2710	20.4	IDN	2711	22.3
IRQ	2709	22.9	SAU	2709	20.7	OMN	2709	22.2	PHL	8542	20.3	KWT	2709	22.1
AGO	2709	22.2	SYR	2709	20.7	IRN	2709	22.0	EGY	2709	19.7	ARE	2711	21.6

Overreporting of exports

Importer:														
USA			Germany			China			United Kingdom			Japan		
Exp.	Prod.	Gap	Exp.	Prod.	Gap	Exp.	Prod.	Gap	Exp.	Prod.	Gap	Exp.	Prod.	Gap
DEU	8901	-19.9	CHN	8901	-20.3	HKG	8703	-20.8	USA	8803	-21.2	SWE	8802	-18.9
FIN	8901	-19.9	BEL	0803	-19.8	HKG	4101	-19.3	DEU	8802	-21.0	SGP	2204	-18.5
PRT	8802	-19.2	AUT	8901	-19.7	HKG	7108	-19.2	HKG	7108	-20.8	SGP	2208	-18.0
MEX	8602	-19.1	DNK	2716	-19.1	JPN	7108	-18.6	CAN	7108	-20.7	NZL	2709	-17.9
KOR	8901	-18.7	BLR	2709	-18.7	ARE	9999	-18.5	USA	8802	-20.7	BHR	7604	-17.6

Notes: Gap is defined as the percentage difference between reported imports by the country in the top line and corresponding exports reported by the country listed in columns. "Prod." denotes the 4-digit product code.

Table 5: Underreporting of exports by country, 2002-2006

Importer:											
USA		**Germany**		**China**		**United Kingdom**		**Japan**		**All five importers**	
Exporter	**Gap**	**Exporter**	**Gap**	**Exporter**	**Gap**	**Exporter**	**Gap**	**Exporter**	**Gap**	**Exporter**	**Gap**
Libya	14.5	Equatorial Guinea	12.1	Equatorial Guinea	14.9	Indonesia	12.1	Iraq	16.3	Equatorial Guinea	12.6
Lesotho	13.5	Indonesia	11.9	Congo	13.5	Lao PDR	11.5	Equatorial Guinea	14.0	Indonesia	12.4
Indonesia	13.3	Ukraine	11.4	Dem.Rep. of Congo	12.7	Myanmar	11.5	Western Sahara	13.7	Philippines	11.6
Philippines	12.7	Philippines	11.2	Tchad	11.8	Bouvet Island	11.4	Indonesia	13.2	Iraq	11.4
Iraq	12.5	Serbia and Monte'gro	11.0	Rwanda	11.8	Falkland Isds	11.2	Botswana	12.8	Western Sahara	11.3

Table 6: Correlation of exporter-specific average trade gaps

	USA	Germany	China	UK	Japan	All
USA	1.0000					
Germany	0.9245	1.0000				
China	0.8357	0.7824	1.0000			
United Kingdom	0.9368	0.9571	0.7986	1.0000		
Japan	0.9015	0.8572	0.8963	0.8582	1.0000	
All 5 importers	0.9700	0.9494	0.9120	0.9564	0.9548	1.0000

Notes: 202 observations.