EL OTRO HUECO COMERCIAL: CORRUPTION AND THE MISREPORTING OF EXPORTS IN LATIN AMERICAN ECONOMIES

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ABSTRACT

Discrepancies in international trade statistics have traditionally been regarded as a problem of reporting rather than of public policy. In recent years a small but growing literature has come to challenge this assumption, arguing that differences in institutional and economic frameworks create incentives to deliberately falsify trade invoices for private benefit. This paper examines this hypothesis by examining bilateral trade relationships within Latin America and the Caribbean between 2000 and 2009. It finds that there is a significant and robust relationship between corruption levels, macroeconomic incentives and the mis-invoicing of trade.
For Margaret, my first great teacher
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INTRODUCTION

Historically there has been a significant focus within the field of international development on ways of increasing the capital stock of developing economies. Early models suggested that labor was abundant in developing countries. Following a Solow growth framework, even absent improvements in productivity, additional capital is expected to cause growth. An array of interventions, ranging from multi-billion dollar aid allocations to $100 microfinance loans has long been predicated on this assumption.

Yet even if this assumption holds, and capital can be effectively allocated in a given developing country, ensuring that it stays there is another matter. In the wake of successive financial crises, much attention has been focused on the greatly increased mobility of capital globally, and the consequences of this shift for international development. The phenomenon of ‘capital flight’ the sudden withdrawal of funds from emerging markets in response to uncertainty, and its determinants, has come to be the object of significant study.

Yet the capital flight literature, indeed the economic development literature as a whole, focuses almost exclusively on legitimate transfers. In doing so, there is a danger that substantial illicit flows may be occluded from scholarly analysis. Each year untold sums of money flow unrecorded between countries through a diffuse range of mechanisms. These include, but are not confined to: transfer pricing abuses by multinational firms; money laundering by criminal networks; and informal systems of remittances. The full extent of such transactions- and their consequences for public policy- remains unknown.
One of the major reasons that illegitimate capital movements have tended to be overlooked in the literature is the empirical challenge which measuring such flows presents. Individuals or groups engaged in clandestine or illicit behavior have strong incentives to conceal their activities, leaving little data available for study. The researcher is therefore forced to utilize indirect methods to identify the tracks left by illicit financial activities. This thesis will employ one such approach, through an analysis of discrepancies bilateral trade statistics for a panel of Latin American and Caribbean economies between 2000 and 2009. Specifically, it will explore whether there is a strong correlation between country-level factors and the mis-invoicing of exports.

The structure of the paper will proceed as follows. It will begin by providing a brief background on the phenomenon of trade mis-invoicing, and proceed to summarize the existing literature on the subject, with particular attention on incentives to mis-invoice. The thesis will then present its central conceptual hypotheses, and describe the empirical methodology to be used to test these propositions. The results of the various regression specifications will be discussed. These will be used to inform an evaluation of current policy recommendations to mitigate the misreporting of trade.
BACKGROUND: TRADE STATISTIC DISCREPANCIES

The existence of ‘gaps’ in trade statistics is not a new phenomenon in economic measurement. Indeed, it has perturbed researchers since at least the mid-twentieth century. Trade discrepancies are discussed directly in the work of Oskar Morgenstern (1950), with regard to both gold and commodity statistics. Conceptually, the problem is a simple one. Countries produce annual trade statistics detailing their exports to- as well as imports from- other nations. Since both statistics theoretically measure the same amount of goods and services, the overall value of both should be the same. Hence for any given pair, the amount that one country reports exporting to its partner should be the same as the amount that its partner reports importing from it.

For example, if Ecuador reported $1billion in exports to Peru in a given year, Peru ought to report $1billion in imports from Ecuador for that year. In practice, this is complicated by the fact that exports are typically valued as freight on board (f.o.b.), whereas imports are priced to include the cost of insurance and freight (c.i.f.), but if these are properly controlled for the two figures ought to be equal. In practice this is rarely the case.

Table 1 presents Ecuador’s reported exports to Peru from 2000-2009. The first row of figures shows the amount that Ecuador reported exporting (f.o.b.) to Peru to the nearest million dollars. The second row shows the amount that Peru reported importing from Ecuador, corrected for the cost of insurance and freight. The final row shows the magnitude of the disparity between the two reported values.

The process of converting and calculating the value for the reporting discrepancy is discussed in more detail in ‘Calculating the Trade Gap’. 
Table 1- Ecuadorean Exports to Peru (Millions of Current U.S. Dollars)

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecuador’s reported</td>
<td>294</td>
<td>342</td>
<td>375</td>
<td>642</td>
<td>606</td>
<td>876</td>
<td>1039</td>
<td>1505</td>
<td>1702</td>
<td>938</td>
</tr>
<tr>
<td>exports to Peru</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peru’s reported imports from Ecuador</td>
<td>319</td>
<td>337</td>
<td>152</td>
<td>161</td>
<td>173</td>
<td>888</td>
<td>1062</td>
<td>1481</td>
<td>1741</td>
<td>1017</td>
</tr>
<tr>
<td>Discrepancy</td>
<td>25</td>
<td>5</td>
<td>223</td>
<td>482</td>
<td>432</td>
<td>12</td>
<td>23</td>
<td>24</td>
<td>39</td>
<td>79</td>
</tr>
</tbody>
</table>

Source: IMF Direction of Trade Statistics (DOTS)

The form of this discrepancy varies from year to year. In some cases Ecuador reported exporting more than Peru reported receiving: in other cases Peru reported importing more than Ecuador reported sending. The size of the discrepancy also varies. For example, in 2001 the gap was only $5 million- the following year it jumped to $223 million.

There are two potential categories of explanation for such discrepancies. The first of these is an essentially benign hypothesis, which views the difference in reporting as largely stochastic- an accumulation of aggregate errors, further compounded by differences in reporting procedures and imperfections in controls for the cost of insurance and freight. An alternative category of explanation argues that such discrepancies stem from legal malfeasance: the deliberate falsification of trade invoices for personal gain.

There are a variety of potential mechanisms by such malfeasance may occur. These will be discussed in greater length in the literature review, but generally speaking, they take one of three forms: misrepresenting the value of the goods being traded; misrepresenting of the quantity of a given good; or misrepresenting the type of good being traded (either as a form of tariff evasion or direct smuggling).
It is important to note that these two classes of explanation are not mutually exclusive. Indeed, for any given trade partnership in which a discrepancy exists, it is likely that both measurement error and deliberate manipulation exist to some extent. The key question for policymakers is whether the latter factor is economically significant and, if so, whether it can be mitigated by effective policy choices. The following section will provide an overview of the state of current research into invoice manipulation, and the incentives which may drive it.
Literature Review

Trade Statistic Discrepancies

Nitsch (2009) provides a critical overview of current empirical work linking trade discrepancies to invoice mispricing, and in turn to illicit capital flows, arguing that the analysis of trade discrepancies is not an appropriate means of assessing the extent of invoice falsification. While the greater portion of his argument relates to specific methodological approaches, he does raise a conceptual criticism which informs much of the thrust of this thesis.

In his concluding remarks, Nitsch argues that ‘[t]he 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’ (2009, p. 16). The premise is accurate, but does not imply his conclusion: that the interplay of factors influencing trade discrepancies precludes substantive analysis of mis-invoicing behavior. While it is true that gaps in trade statistics do arise from reasons other than mispricing, this merely argues against assuming all gaps occur as a result of mispricing. There is utility in exploring the determinants of discrepancies in trade statistics, even though their composition may include factors unrelated to invoice falsification. While Nitsch is correct in advocating caution in the analysis of bilateral trade discrepancies, his conclusion is overly broad.

A more nuanced analysis is presented in earlier empirical work on the phenomenon. Yeats (1990, 1995) maintains that mispricing does account for discrepancies in bilateral trade statistics, while
also recognizing that a broad array of other factors may also contribute. His work calls into question the reliability of partner country statistics, arguing that absent improvements in data collection, variations in reporting present an insurmountable challenge to the analysis of bilateral trade. However, his argument rests upon the assumption that reporting country statistics represent an accurate basis of comparison. If there is reason to believe that export statistics themselves may be inaccurate (Biswas, 2009), then even perfectly reported import statistics should not be expected to correspond to them.

More germane to the present state of empirical research is Yeats’ recognition that differentiated incentives for trade mispricing exist, each with its own discrete effects. He correctly points out that while ‘false invoicing often can be detected in matched trade data, a disquieting fact is that the combination of incentives may actually be self-disguising’ (1990, p. 136). This over-lapping of potential incentives to mis-invoice has two general implications. Since different forms of false invoicing may mask one another, net approaches to trade mis-invoicing will tend to understate the phenomenon ². Secondly, since the total extent of mispricing cannot be precisely measured, it is impossible to determine what proportion of the statistical gap can be attributed to mis-invoicing.

² For example, since exports are not typically subject to taxation, but imports are, a party might choose to underestimate the value of goods to an importing jurisdiction to reduce the tariff burden which they might face. Conversely, in a country with strong capital controls incentives might exist for firms to over-report the amount of goods imported as a means of expatriating funds. For a detailed analysis of this issue and potential methodologies for measuring trade mis-invoicing, see Kar & Cartwright-Smith (2008).
On a superficial level, this would appear to support the argument of Nitsch: if the proportion of mis-pricing that occurs as a result of reporting error and the proportion that occurs due to malfeasance cannot be delineated, how can any inferences regarding either phenomenon be drawn? However, even if perfect delineation between the stochastic and non-stochastic components of trade discrepancies is not be possible in practice, even if it were to be it would be of secondary interest to the study of the institutional and other factors which contribute to reporting gaps.

Given that trade discrepancies exist, the conditions which encourage the phenomenon are worthy of investigation. If these may be determined by macro analysis, the question of precise composition is moot. From a policy perspective, the objective is not to eliminate all sources of error from trade statistics, but rather to seek to understand some of the factors which drive mispricing, and to provide recommendations to mitigate the practice. The following paragraphs will explore some of these approaches in the literature, and explore their applicability to the approach utilized within this thesis.

**Incentives to Falsify Invoices**

The first major contribution to the analysis of trade discrepancies and the practice of mis-invoicing is that of Bhagwati (1964) which links discrepancies between export (f.o.b.) and import (c.i.f.) statistics in Turkey to the black market premium for foreign exchange. In subsequent work (1967), Bhagwati refines his analysis, separating invoice falsification into four
different conceptual categories: export over-invoicing, import under-invoicing, export under-invoicing and import over-invoicing. He delineates between a variety of potential motivations for individuals to engage in mis-invoicing, including tariff regimes, capital controls, export subsidies, and black market exchange premiums. Much of the subsequent literature on trade mis-invoicing has employed this framework to facilitate the analysis of these incentive factors.

Of these, import tariffs are most often cited as contributing to gaps in trade reporting. By imposing a direct cost on trade, it is argued, tariffs create an ex ante incentive to misrepresent the value, quantity or type of goods being traded. Biswas (2009) establishes a theoretical model for such behavior, which demonstrates that, given the existence of tariff regimes, a variety of forms of deliberate mis-invoicing may take place, even in situations where none of the other incentives defined by Bhagwati (1967) are in place.

Exploring this issue in an applied setting, Fisman and Wei (2004) utilize bilateral trade data between Hong Kong and mainland China to demonstrate a robust relationship between rates of taxation and trade discrepancies. They find that goods which are subject to higher rates of trade taxation are subject to wider ‘evasion gaps’ than products subject to lower rates, presenting evidence of under-reporting of imports as well as the falsification of invoice labels. Maintaining a similar focus, Fung et al. (2011) explore trade patterns between China and Hong Kong. The authors find evidence that import tariffs, along with other forms of trade distorting policy (such as export tax credits) are significantly associated with mis-invoicing. The authors also find evidence that invoice falsification is much more prevalent among Chinese state owned
enterprises than privately held companies, which may suggest a link between mis-invoicing behavior and political corruption.

Another commonly discussed incentive to misrepresent the value of exports is the existence of black market premiums on foreign exchange. In situations in which capital controls or other factors foster illicit foreign currency transactions at rates differing from the official exchange rate, exporters may actually have an incentive to over-invoice their imports so that money can be transferred to realize a profit through the selling of foreign exchange on the black market.

Applying this framework to their analysis of the Brazilian economy from 1979-1985, Barbosa et al. (1988) find a significant relationship between the black market premium on the U.S. dollar in Brazil, and import over-invoicing. This finding suggests that trade discrepancies may be driven in part by the incentive to transfer capital illicitly (Kar & Cartwright-Smith, 2008). Such a conclusion is supported by the work of Buehn and Eichler (2010) who find a robust relationship between black market premiums and the mis-invoicing of worldwide trade for a sample of eight-six countries from 1980-2005.

**Mis-invoicing and Smuggling**

While this thesis will not seek to overtly disaggregate mispricing mechanisms, the smuggling of goods presents an interesting case as it differs in some respects from other incentive factors: unlike other forms of mispricing which typically entail the incorrect invoicing of a value or
quantity of a good, smuggling involves the deliberate false declaration of the type of good being imported or exported\(^3\).

The link between smuggling and invoice falsification was first made explicit in Bhagwati and Hansen (1973). The authors speculate that collaboration between exporters and importers could allow for smuggling as a means of tariff evasion. Although they do not test the proposition empirically, subsequent work by Donogh C. McDonald (1985) confirms this hypothesis, finding a statistically significant correlation between trade data discrepancies and incentives to smuggle\(^4\).

In a recent example, Fisman and Wei (2009) compare the statistical discrepancy for a specific good. The authors compare the discrepancy between exporting countries’ records and the United States’ importing records for trade in antiquities to that of a ‘placebo’ commodity. Since the two classes of goods are subject to zero import tariffs to the United States, but different reporting incentives in their country of export, the relative differences in reporting gaps provides suggestive evidence of the extent to which ‘smuggling gaps’ compose overall trade discrepancies. While their findings relate to a specific sector, they are illustrative of the fact that novel research design can provide significant insights into the drivers of mis-invoicing.

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\(^3\) Note that smuggling here includes only goods which are recorded in customs in either the exporting or importing jurisdiction (or both). Narcotics and other wholly illegal commodities are likely to fall largely outside of this category, although some misrepresentation of them as legal commodities may occur.

\(^4\) It should be noted however that these results vary significantly by country and time period, which McDonald attributes to inter-group and inter-temporal differences in enforcement levels.
**CONCEPTUAL HYPOTHESES**

The primary methodological goal of this thesis will be to evaluate the link between trade mispricing and corruption postulated by Bhagwati (1964). In order to do so it will test the following null hypothesis:

**Hypothesis 1:** There is no significant correlation between country-level corruption and discrepancies in bilateral export statistics.

This hypothesis follows the ‘benign’ position advocated by Nitsch which maintains that gaps in bilateral trade are principally stochastic, generated in large part by measurement error or differences in reporting procedures across countries, and independent of short-run macroeconomic factors. Should evidence of a statistically significant relationship between corruption and trade gaps exist, the thesis will reject this hypothesis, in favor of the following alternative:

**Hypothesis 2:** A significant correlation exists between country-level corruption factors and discrepancies in bilateral trade statistics.

Should evidence in support of this primary hypothesis be found, the thesis will go on to assess the impact of incentives at the macroeconomic level to explore the extent to which such illicit flows may be driven by broad financial incentives.
CALCULATING THE TRADE GAP

As described in the introductory section, gaps in the reporting of trade are conceptually simple. One country’s measurements of the goods it exports to its neighbor should be the same as its neighbor’s measurement of the good which it imported from that country, once other factors are controlled for.

Following Morgenstern (1950), an export discrepancy is calculated using the difference between exports and imports. To avoid the problem of ‘netting out’ flows in opposing directions (Kar & Cartwright-Smith, 2008), the absolute value of the export gap is used:

\[ Y_{\text{Export gap}} = |X_{ij} - M_{ji}| \]

Where \( X_{ij} \) represents Country I’s reported exports to Country J, and \( M_{ji} \) represents Country J’s reported imports from Country I over the same period. This provides an aggregated value for total trade mis-invoicing. To allow for cross-country comparisons between differently sized economies, \((X_{ij} - M_{ji})\) is divided by \(X_{ij}\), such that the export gap is expressed as a percentage of Country I’s reported bilateral exports. This approach is the corollary of that employed by Fisman and Wei (2009), in which an import gap is calculated and expressed as a percentage of bilateral imports:

\[ Y_{\% \text{Export gap}} = \frac{|(X_{ij} - M_{ji})|}{X_{ij}} \]
However, since exports are recorded in terms of the value of the goods as ‘freight on board’ (f.o.b.) while imports are recorded including the ‘cost of insurance and freight’ (c.i.f.) a constant term is introduced to net out these costs:

\[ Y_{\% \text{ Export Gap}} = \frac{|(X_{ij} - M_{ji}/1.1)|}{X_{ij}} \]

This ten percent conversion factor is used throughout the literature (Morgenstern, 1950) (McDonald, 1985) (Kar & Cartwright-Smith, 2008). While the use of a constant factor is clearly less desirable than controlling for the individual transport and insurance costs associated with each bilateral trading partnership (Yeats, 1995), the lack of reliable data on such costs, in addition to the limited resources available to the researcher, preclude such an approach. Furthermore, the error associated with such a conversion is likely to be mitigated in part by the use of fixed effects to control for country pairings in the empirical model.
**DESCRIPTIVE STATISTICS**

Following this simple arithmetic procedure, values were calculated for all major bilateral trade corridors within the Latin America & Caribbean region\(^5\). Chart 1 presents these values along with total intra-regional export and import\(^6\) volumes. This allows for a comparison of overall export growth and the trend for export mis-invoicing.

**Chart 1- Regional Export Volumes & Discrepancies**

Chart 1 presents two notable trends. Firstly, it appears that gross trade volumes are relatively constant irrespective of whether reporting figures come from the exporting or importing

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\(^5\) A complete table of country level descriptive statistics is presented in Appendix IV.

\(^6\) The import figures presented are corrected for the cost of insurance and freight, as described in the preceding section.
country\textsuperscript{7}. This would support the hypothesis that, at the regional level, there is no systemic bias in the reporting of trade. This appears to support in line with the ‘benign’ hypothesis, which assumes that trade discrepancies are simply random reporting errors—statistical noise.

Under this hypothesis, it is to be expected that trade mis-invoicing would increase as reported trade increases, since increased trade volumes would result in more opportunities for erroneous reporting. However, this is also consistent with alternative hypotheses. For example, following the model put forward by Kar & Cartwright (2009)—in which trade mis-invoicing functions as a vehicle for illicit capital flight—it is not inconsistent to expect that increased trade would provide increased scope for illicit capital movement in the form of the deliberate falsification of invoices.

Secondly, while the level of export mis-invoicing increases across the period, reported exports grow at a faster rate. The resultant decline in the ratio of the reporting gap for exports to total exports is expressed by the downward trend on the secondary axis. This suggests that growth in the trade discrepancy is not directly proportionate to overall trade growth. A number of potential factors could be driving this. Faster growing exporters may also employ better reporting practices, or an improved commercial environment may reduce the relative benefits of illicit activity, for example. However, a clear causal framework is hard to discern, for while aggregated statistics provide a useful overview of bilateral trade, they also conceal significant heterogeneity at the country level.

\textsuperscript{7} There is however some divergence before and after the onset of the financial crisis. One possible hypothesis is that increased uncertainty in such periods creates additional incentives for tariff evasion. However, further study would be required to determine whether there is a relationship between trade reporting patterns and financial crises.
Disaggregation at the country level provides some insight into how trade discrepancies vary depending on the reporting economy. Chart 2 presents total regional trade for each country in the sample, as reported both by exporting economy and its bilateral partners. This reveals some notable trends within the data. For many reporting economies, the aggregate values of trade reported are relatively equal. Some economies, however, display large disparities between aggregate self-reporting and partner reporting.

**Chart 2- Gross Regional Export Reporting by Country**

![Chart of Gross Regional Export Reporting by Country](image)

The key inference to be drawn is that the determinants of trade gaps do not appear to be uniform across economies within the region. Chart 2 also indicates that researchers should be cautious in
ascribing broad characteristics to partner country reporting. Following the assumption of Yeats (1990), reported exports would be expected to exceed imports reported by partner countries, and indeed many countries within the region appear to follow this trend: notably Argentina and Brazil. Yet in some cases here, in particular that of Mexico, bilateral partner countries reported receiving significantly more in imports from the country than the country itself reported exporting. The determinants of these differences appear to be country specific, and argue against making general claims about the characteristics of partner country reporting.

Looking at the absolute levels of export mis-invoicing has the benefit of demonstrating the scale of the sums involved. It does not however demonstrate the significance of the gaps in terms of the relative size of the exporting economy. Smaller economies may produce discrepancies that are lower in dollar terms, yet which comprise a larger relative share of economic activity. Chart 3 presents these discrepancies as a percentage of the reported exports of each economy.

Within the selection of countries, Panama is a clear outlier, reporting average exports that are on average five times smaller than the imports which partner countries report receiving from it. This is likely to be driven by the country’s role as a hub for international trade. Imports from third countries may be routed through the country, resulting in recipient economies recording the goods as being from Panama.8

A less immediately striking, but more significant feature of the chart, is that the extent of mis-

8 It is likely for this reason that the Ecuadorian paja toquilla is generally referred to in English as a ‘Panama’ hat.
Chart 3-Mean Export Discrepancies (% of Total Reported Exports)

Exporting clearly varies widely among economies. Some of the large regional economies, such as those of Mexico and Argentina, demonstrate very high rates of mis-invoicing, yet others, such as those of Brazil and Chile, do not. This is also true of smaller economies. Jamaica demonstrates a very high level of mis-invoicing, whereas nearby Trinidad & Tobago- which shares Jamaica’s language and colonial past- do not. Clearly the factors driving these differences do not admit of
simple explanation. A more detailed empirical analysis will be necessary to determine the factors driving mis-invoicing.
EMPIRICAL SPECIFICATIONS

The conceptual link between corruption and mis-invoicing has been posited for some time in the literature (Bhagwati, On the Under-Invoicing of Imports, 1964), but a lack of data from which to make international comparisons has precluded attempts to test this hypothesis empirically. Fortunately, recent progress in the development of cross-country indices regarding corruption, particularly the World Bank’s World Governance Indicators (WGI) allow for analytical exploration of the effects of changes in corruption levels on a variety of factors.

Specifically, the ‘Control of Corruption’ variable, (for which data is currently available for 2000 and from 2002 to 2009) allows for an empirical investigation of the first conceptual hypothesis outlined in the preceding section. Under the benign hypothesis, no significant relationship would be predicted between mis-invoicing and the extent of corruption within a country, except insofar as domestic corruption may affect the ability to accurately monitor exports.

To explore this hypothesis, a simple form regression was established, using the Control of Corruption variable for the exporting economy as the primary variable of interest. To this, a variable for the importing country’s mean tariff level, taken from the World Bank’s Global Development Finance (GDF) dataset was added, to explore the role of tariff evasion posited by Bhagwati (1964) and subsequent authors. In order to control for country size and trading intensity, variables for logged GDP and trade openness⁹ were also included from the GDF dataset.

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⁹ \( X_t + \frac{M_t}{GDP} \)
To explore the relationship in detail, each specification was tested with two variants of the dependent variable: \(|X_{ij} - M_{ji}|\), to measure aggregate mispricing, and \(|X_{ij} - M_{ji}|/X_{ij}\) to measure percentage mispricing. Since the former of these is a volume measure and the latter a ratio, this approach allows for a separate exploration of the determinants of gross mispricing across the region, as well as its effects as a percentage of trade for each economy. To correct for both country level and inter-temporal exogeneity, fixed effects were introduced for both year and country pairing. General Method of Moments estimation was employed to ensure the consistency of estimators (Arellano & Bond, 1991) along with standard error clustering on the country pairing identifier to ensure robust standard errors. The initial regression specification is outlined below:

\[
Y = \beta_0 + \beta_1 \text{Control of Corruption}_i + \beta_2 \text{Tariff Level}_j + \beta_3 \log GDP_i + \beta_4 \log GDP_j + \beta_5 \text{Trade Openness}_i \\
+ \beta_6 \text{Trade Openness}_j + \Sigma \delta_1 \text{Time} + \Sigma \delta_2 \text{Country Pair} + \mu
\]

To explore the hypothesis of that financial motivations encourage mis-invoicing as a means of illicit capital transfer (Kar & Cartwright-Smith, 2008) (Buehn & Eichler, 2010), a variable for interest rate differentials was included. This was constructed using World Bank data on real interest rates for the period, such that it would take a positive value when the interest rate in the importing country (ie. the potential returns to investment) was greater than that of the exporting country:

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10 This was carried out in Stata using the xtivreg2 command (Schaffer, M.E., 2010. xtivreg2: Stata module to perform extended IV/2SLS, GMM and AC/HAC, LIML and k-class regression for panel data models. http://ideas.repec.org/c/boc/bocode/s456501.html).
\[ Y = \beta_0 + \beta_1 \text{Control of Corruption}_i + \beta_2 \text{Tariff Level}_j + \beta_3 \text{Interest Rate Differential}_{ij} \]
\[ + \beta_4 \log GDP_i + \beta_5 \log GDP_j + \beta_6 \text{Trade Openness}_i + \beta_7 \text{Trade Openness}_j + \Sigma \delta_1 Time + \Sigma \delta_2 Country Pair + \mu \]

Following the results of these regressions, additional variables were added from the GDF database to explore the extent to which macroeconomic and financial conditions in the exporting economy might generate incentives to mis-invoice trade. The specific variables included were: the real interest rate; the consumer price index\(^{11}\); the official exchange rate; and the money supply (M1):

\[ Y = \beta_0 + \beta_1 \text{Control of Corruption}_i + \beta_2 \text{Tariff Level}_j + \beta_3 \text{Interest Rate Differential}_{ij} \]
\[ + \beta_4 \text{CPI}_i + \beta_5 \text{Exchange Rate}_i + \beta_6 \text{Money Supply}_i + \beta_7 \log GDP_i + \beta_8 \log GDP_j \]
\[ + \beta_9 \text{Trade Openness}_i + \beta_{10} \text{Trade Openness}_j + \Sigma \delta_1 Time + \Sigma \delta_2 Country Pair + \mu \]

The final main model added further variables to measure the influence of similar factors in the importing economy, yielded the specification:

\[ Y = \beta_0 + \beta_1 \text{Control of Corruption}_i + \beta_2 \text{Tariff Level}_j + \beta_3 \text{Interest Rate Differential}_{ij} \]
\[ + \beta_4 \text{CPI}_i + \beta_5 \text{Exchange Rate}_i + \beta_6 \text{Money Supply}_i + \beta_7 \text{CPI}_j + \beta_8 \text{Exchange Rate}_j + \beta_9 \text{Money Supply}_j \]
\[ + \beta_{10} \log GDP_i + \beta_{11} \log GDP_j + \beta_{12} \text{Trade Openness}_i + \beta_{13} \text{Trade Openness}_j \]
\[ + \Sigma \delta_1 Time + \Sigma \delta_2 Country Pair + \mu \]

\(^{11}\) CPI data for Chile is not currently available from the World Bank. This was added from the public available data on the website of Banco Central de Chile: [http://www.bcentral.cl/estadisticas-economicas/](http://www.bcentral.cl/estadisticas-economicas/)
REGRESSION RESULTS

The results of these models are presented in Table 2. The first three columns present the results for each of the specifications where the dependent variable is measured as the absolute level of mispricing in current U.S. Dollars. The second three columns present the results for the same groupings of independent variables where the dependent mispricing variable is expressed as a percentage of overall exports. The former allow for the examination of the determinants in aggregate terms, while the latter allow for comparisons across economies with differing size and relative openness to international trade.

The most notable result is that the Control of Corruption variable is highly significant and takes a negative sign across all specifications. This implies that countries with lower levels of corruption are subject to lower levels of export mis-invoicing, both in absolute terms and as a percentage of overall trade. The hypothesis that discrepancies in export figures are unrelated to the level of corruption in the exporting economy is therefore rejected. There is strong evidence that corruption levels drive mispricing, suggesting that individuals are engaged in the deliberate falsification of invoices for personal gain.

However, while these specifications demonstrate a clear relationship between corruption and mispricing, the value of the coefficients generated should be treated with caution.\textsuperscript{12}

\textsuperscript{12} Appendix III provides a brief discussion of issues relating to drawing inferences from the World Governance Indicators.
The effect of the other variable of interest, mean importer tariff level, is more ambiguous however. Where mispricing is expressed as a percentage of exports, the partner tariff variable takes a positive sign for all three specifications (although the coefficient is not significant for the third specification, likely as a result of the reduced sample size). This is consistent with the model presented by Biswas (2009) and subsequent empirical studies (Fung, Yau, & Zhang, 2011), which argue that higher tariff levels increase the incentives for individuals to engage in invoice falsification.

However, where mispricing is expressed in dollars, partner tariff level is significant and takes a negative sign for two of the specifications. This is a counter-intuitive result, and robust both when individual large economies are removed from the model, and when the dependent variable is not expressed as an absolute value. One possible explanation for this result is that the tariff variable is over-aggregated and that variance in tariff levels across sectors in larger economies might not be adequately represented by a mean value. Irrespective of the cause however, this finding argues against assuming that tariff levels have uniform effects on the volume and extent of mispricing in all cases.

The results for the size of the economies admit of simpler interpretation. Across all specifications of the model, there is a positive and highly significant relationship between gross domestic product and the extent of mis-invoicing. Where mispricing is expressed in absolute terms, higher levels of output in both the exporting and importing economy are positively associated with
Table 2. Regression Results

|                      | Dependent Variable: $|X_{ij} - M_{ij}|$ | Dependent Variable: $|X_{ij} - M_{ij}|/X_{ij}$ |
|----------------------|----------------------|----------------------|
|                      | 1 (n=2323)           | 2 (n=1959)           | 3 (n=921) |
| Control of Corruption| -83.87*** (17.55)    | -91.81*** (23.52)    | -141.19**** (16.97) |
| Tariff Level of Partner | -1.23 (3.62) | -10.29** (5.07) | -12.63* (7.43) |
| Interest Rate        | -3.69** (0.79)       | 5.05*** (1.27)       | - (0.00) |
| Differential Index   | -1.45* (0.01)        | -3.03** (0.01)       | -0.09 (0.00) |
| Exchange Rate        | -0.00*** (0.00)      | 0.00*** (0.00)       | 0.18 (0.23) |
| Money Supply         | -0.00*** (0.00)      | -0.00*** (0.00)      | - (0.00) |
| Partner Consumer Price Index | - (0.00) | - (0.00) | 0.07 (0.09) |
| Partner Exchange Rate | - (0.00) | - (0.00) | -0.00 (0.00) |
| Partner Money Supply | - (0.00) | - (0.00) | -0.00 (0.00) |
| Log GDP              | 156.64*** (23.85)    | 171.95*** (27.06)    | 141.87*** (15.75) |
| Partner              | 69.47*** (14.80)     | 99.43*** (19.01)     | 96.57*** (25.80) |
| Trade/GDP            | 1.10** (0.53)        | 0.55 (0.79)          | 0.93* (0.55) |
| Partner              | -0.36 (0.28)         | 0.43 (0.33)          | 0.57 (0.67) |

greater levels of trade mis-invoicing. This fits with the intuition that larger economies trade more, and hence the dollar amount of trade that is mispriced for those economies is likely to be greater than for smaller economies.
Interestingly however, where mispricing is expressed in percentage terms, there is also a significant relationship between mis-invoicing and GDP. This implies that for larger economies, the ratio of mispricing to total exports is greater than for smaller economies. This may be a result of more complex large economies affording individuals more opportunities to engage in invoice falsification.

In a related finding, the openness to trade of the exporting economy is statistically significant and positively associated with trade mispricing across five of the six specifications. This argues against the consensus view that more open economies are less prone to corrupt practices, supporting the arguments of Knack & Azfar (2003) and Gatti (2004) who find that the relationship is highly sensitive to sample selection and model specification.
Informational Challenges

The primary finding of this thesis has been that there is a strong statistical link between the level of corruption in exporting economies within Latin America and the Caribbean, and the extent of export mis-invoicing. Falsified invoices not only lower government revenues in partner economies, they also represent an unreported transfer of value between countries. Such transfers may act to undermine fiscal and monetary policy, fuel illicit markets in foreign exchange and increase overall economic volatility. Furthermore, such transfers also represent a mechanism which could potentially be used by criminal groups to launder funds or finance illegal activities. Curtailing or limiting trade discrepancies should therefore be a matter of priority for regional governments. However, formulating a policy response to the problem of trade mis-invoicing presents a number of challenges.

A significant problem is the inherent difficulty of disaggregating trade discrepancies by source. Reporting error and deliberate falsification both play a role, but the extent of either cannot be firmly defined. This is further complicated by problems of endogeneity involving a number of related factors, which may influence each other in ways which are not easily captured. Most challenging however, is the issue of implementation. Reducing corruption and improving reporting are simple to advocate, but extremely difficult to realize.
While some empirical research has been carried out on the issue of trade mis-invoicing, it has largely been conducted at the macroeconomic level, providing some information on the incentives which drive the phenomenon, but little information on how it operates at a sectoral level. Fisman and Wei (2009) demonstrate that a narrower focus has the potential to yield some useful findings which in turn presents the possibility of adopting nuanced policy approaches.

However, even with more detailed information, the complexity of relationships between many of the key factors influencing mis-invoicing would still greatly complicate inquiry. For example, in countries with a high prevalence of corruption the quality of reporting is likely to be suffer, as officials in such countries are likely to be less punctilious than their peers in low corruption countries. Indeed, within the sample of countries used for this analysis, the correlation between the Control of Corruption variable employed and another one of the World Governance Indicators, Regulatory Quality, is very high ($r=0.8$). Separating corrupt behavior from poor reporting may be hard to achieve in practice.

**Tariff Levels & Liberalization**

Much of the literature to date has focused on tariff levels as a potential mechanism to reduce mis-invoicing. For example in their study of 86 countries over the period 1980-2006, Buehn and Eichler (2010) find a strong correlation between financial incentives and the incidence and degree of mis-invoicing, and that higher fines (in terms of GDP per capita) have the potential to significantly curtail mis-invoicing. Similarly, focusing on entrepôt trade between China and
Hong Kong, Fung and his co-authors argue that exporters carefully weigh incentives to mis-invoice, balancing the potential benefits of export subsidies against the associated costs of import tariffs. Both sets of authors argue for greater liberalization of both trade and financial arrangements as a means of reducing the incentives to engage in invoice falsification.

However, once corruption is controlled for, the direct effect of lowering tariffs on corruption is unclear. The specifications above find a negative correlation between tariff levels and aggregate trade discrepancies, yet a positive correlation between tariff levels and percentage mis-invoicing. This suggests that tariff levels may interact with mis-invoicing behaviors in complex ways. For example, Gatti (2004) finds evidence for a link between the level of tariff barriers and country level corruption, illustrating one such indirect means by which tariff levels may influence mis-invoicing. By providing officials with more opportunities to extract bribes, countries with high tariff levels may in turn foster corruption, facilitating invoice falsification and reducing the regulatory capacity of the customs agency.

While liberalization is a standard prescription of many writers in the literature, their analysis tends to overlook the reasons why tariffs come into being and persist in the first instance. As a significant body of work now attests (Rodrik, 1995) (Hoekman & Kostecki, 2001) tariffs are produced by a complex process of political economy in which interest groups play a strong role. Failing to account for these types of interactions- much less proffering political reforms to address them- is bound to lead to facile policy proposals.
CONCLUSION

The goal of this thesis has been to test the hypothesis that there is no evidence of a link between corruption or fiscal incentives and the mis-invoicing of trade in Latin America & the Caribbean. All specifications of the empirical model imply that this hypothesis should be rejected. There is strong evidence of a link between country-level corruption and the mis-invoicing of exports.

This supports the conjecture that the falsification of invoices can and does function as a means of transferring value out of economies in search of better returns or more stable conditions elsewhere. Though it does demonstrate that macroeconomic factors may influence such behavior, this thesis does not seek to delineate or disentangle the varied means by which such transfers might proceed.

The wider conceptual concern which this thesis raises is that statistical discrepancies in national accounts should not be dismissed by researchers. Where the causes of such gaps - whether in trade or national accounts or other statistics - are benign, they impede knowledge. Where discrepancies arise from clandestine action they impede human progress. Policymakers should be concerned by both.
APPENDIX I- LIST OF COUNTRIES

ARGENTINA
BOLIVIA
BRAZIL
CHILE
COLOMBIA
COSTA RICA
DOMINICAN REPUBLIC
ECUADOR
EL SALVADOR
GUATEMALA
HAITI
HONDURAS
JAMAICA
MEXICO
NICARAGUA
PANAMA
PARAGUAY
PERU
TRINIDAD & TOBAGO
URUGUAY
VENEZUELA
## Appendix II- Variable Descriptions

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Source</th>
<th>Database</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export Mis invoicing</td>
<td>IMF</td>
<td>DOTS</td>
<td>See ‘Calculating the Export Gap’ for full description.</td>
</tr>
<tr>
<td>Control of Corruption</td>
<td>World Bank</td>
<td>WGI</td>
<td>Corruption index ranging from -2.5 (worst) to 2.5 (best)</td>
</tr>
<tr>
<td>Partner Tariff Level</td>
<td>World Bank</td>
<td>GDF</td>
<td>Mean tariff level of reporting economy.</td>
</tr>
<tr>
<td>Interest Rate Differential</td>
<td>World Bank</td>
<td>GDF</td>
<td>Real interest rate of importing economy minus that of exporting economy.</td>
</tr>
<tr>
<td>Consumer Price Index, Partner CPI</td>
<td>World Bank, Banco Central de Chile</td>
<td>GDF</td>
<td>Consumer Price Index (2005=100)</td>
</tr>
<tr>
<td>Exchange Rate, Partner X Rate</td>
<td>World Bank</td>
<td>GDF</td>
<td>Official US Dollar exchange rate.</td>
</tr>
<tr>
<td>Money Supply, Partner M</td>
<td>World Bank</td>
<td>GDF</td>
<td>M1, converted into current US Dollars</td>
</tr>
<tr>
<td>Log GDP, Partner Log GDP</td>
<td>World Bank</td>
<td>GDF</td>
<td>Natural log GDP in current US Dollars</td>
</tr>
<tr>
<td>Trade Openness, Partner Trade Open</td>
<td>World Bank</td>
<td>GDF</td>
<td>Trade as share of GDP</td>
</tr>
</tbody>
</table>
APPENDIX III- ON USING THE WORLD GOVERNANCE INDICATORS

As noted in the ‘Regression Results’ section, a degree of caution should be applied in interpreting the coefficients on the ‘Control of Corruption’ variable taken from the World Governance Indicators data set.

This is not a result of the argument that many critics have made that the World Governance Indicators cannot be used to conduct reliable estimates of trends across time (see for example Arndt & Oman (2006)). Rather as Kaufman et al. (2007) argue, the indicators are designed to enable comparisons of relative changes in governance over time in absolute terms.

However, owing to differences in standard errors for individual country governance scores and the level of aggregation involved in the model, it would be inappropriate to interpret the coefficient on the ‘Control of Corruption’ variable to produce numerical estimates of the volume or percentage of trade mis-invoicing which would increase or decline as a result of a change in governance.

The use of this variable is intended to test the hypothesis that a relationship exists between the level of corruption in a given country within the sample and the prevalence of trade mis-invoicing. Inferences beyond the sign of the coefficient at either the regional or the country level are not recommended.
### APPENDIX IV - TRADE LEVELS & DISCREPANCIES

<table>
<thead>
<tr>
<th>Country</th>
<th>Self-Reported Exports</th>
<th>Imports Reported by Partners</th>
<th>Total Mean Discrepancy ($)</th>
<th>Total Mean Discrepancy (% of Exports)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>16883.74</td>
<td>40978.83</td>
<td>170114.8</td>
<td>100</td>
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<tr>
<td>Bolivia</td>
<td>250659.8</td>
<td>16110.8</td>
<td>1108.355</td>
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<tr>
<td>Brazil</td>
<td>68721.06</td>
<td>238636.1</td>
<td>27859.07</td>
<td>11</td>
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<tr>
<td>Chile</td>
<td>69135.29</td>
<td>67344.32</td>
<td>7461.137</td>
<td>11</td>
</tr>
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<td>Colombia</td>
<td>16977.64</td>
<td>73038.04</td>
<td>9027.12</td>
<td>13</td>
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<td>Costa Rica</td>
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<td>Dominican Republic</td>
<td>32611.59</td>
<td>4377.078</td>
<td>1499.777</td>
<td>35</td>
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<tr>
<td>Ecuador</td>
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<td>27847.96</td>
<td>8491.548</td>
<td>26</td>
</tr>
<tr>
<td>El Salvador</td>
<td>20365.5</td>
<td>10688.47</td>
<td>1923.583</td>
<td>16</td>
</tr>
<tr>
<td>Guatemala</td>
<td>426.224</td>
<td>18068.35</td>
<td>3126.672</td>
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<tr>
<td>Haiti</td>
<td>5349.64</td>
<td>426.2173</td>
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<tr>
<td>Honduras</td>
<td>412.596</td>
<td>6163.818</td>
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<td>30</td>
</tr>
<tr>
<td>Jamaica</td>
<td>98545.4</td>
<td>749.8873</td>
<td>400.6007</td>
<td>97</td>
</tr>
<tr>
<td>Mexico</td>
<td>3841.193</td>
<td>212728.9</td>
<td>166494.7</td>
<td>169</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>3965.267</td>
<td>4082.446</td>
<td>849.5383</td>
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<tr>
<td>Panama</td>
<td>12880.58</td>
<td>24287.17</td>
<td>20380.24</td>
<td>514</td>
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<tr>
<td>Paraguay</td>
<td>32424.92</td>
<td>14950.06</td>
<td>6528.079</td>
<td>51</td>
</tr>
<tr>
<td>Peru</td>
<td>15996.61</td>
<td>29837.69</td>
<td>5032.591</td>
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</tr>
<tr>
<td>Trinidad &amp; Tobago</td>
<td>15230.23</td>
<td>15837.66</td>
<td>849.1027</td>
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<td>Uruguay</td>
<td>51570.65</td>
<td>16001.79</td>
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<tr>
<td>Venezuela</td>
<td>16883.74</td>
<td>60511.39</td>
<td>14957.25</td>
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BIBLIOGRAPHY


