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Coordinating Tax Reforms in the Poorest Countries

Can Lost Tariffs be Recouped?

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Abstract

A revenue-neutral switch from trade taxes to domestic consumption taxes is fraught with implementation challenges in countries with a large informal sector. It is shown for a sample of low-income countries over 25 years that they have had a mixed record of offsetting reductions in trade tax revenue. The paper then analyzes the specific case of Nepal, using a unique data set compiled from unpublished customs records of imports, tariffs and all other taxes levied at the border. It estimates changes to revenue and domestic production associated with two sets of reforms: i) proportional tariff cuts coordinated with a strictly enforced value-added tax; and ii) proposed tariff cuts under a regional free trade agreement. It is shown that a revenue-neutral tax reform is conditional on the effectiveness with which domestic taxes are enforced. Furthermore, loss of revenue as a result of intra-regional free trade can be minimized through judicious use of Sensitive Lists that still cover substantially all the trade as required by Article XXIV of the GATT.

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COORDINATING TAX REFORMS IN THE POOREST COUNTRIES: CAN LOST TARIFFS BE RECOUPED?

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ACRONYMS

ARF Agricultural Reform Fee

ASYCUDA Automated System for Customs Data

AVE Ad Valorem Equivalent

CGE Computable General Equilibrium

GATT General Agreement on Tariffs and Trade

GDP Gross Domestic Product

GMM Generalized Method of Moments

HS Harmonized Commodity Description and Coding System

IMF International Monetary Fund

ISIC International Standard Industrial Classification

IV Instrumental Variables

MFN Most Favored Nation

LDC Least Developed Countries

ROW Rest of the World

SAFTA South Asian Free Trade Area

SL Sensitive List

TRIST Tariff Reform Impact Simulation Tool

2SLS Two-Stage Least Squares

VAT Value-Added Tax

WGI World Governance Indicators

WTO World Trade Organization

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COORDINATING TAX REFORMS: CAN LOST TARIFFS BE RECOUPED?

> "Import tariffs should generally be ranked between four and twenty percent ad valorem intended for [the monarch's] revenue rather than for trade limitation."
>
> – Kautilya, *Arthashastra*, circa 300 BC[1]

> "Little else is requisite to carry a state to the highest degree of opulence from the lowest barbarism, but peace, *easy taxes*, and a tolerable administration of justice."
>
> – Adam Smith, quoted in the *Collected Works of Dugald Stewart*, 1755[2]

1.1 INTRODUCTION

This paper analyzes the immediate revenue implications of trade and fiscal policy reforms. The emphasis on "immediate" is important because over the long run, a less distorted economy allocates resources better and is likely to contribute to economic growth that widens the tax base. Liberalization thereby pays for itself over time. Even in the short run it is not always the case that tariff cuts automatically lead to revenue losses (Greenaway & Milner 1991).[3] However, if the immediate cost of potential revenue loss is not addressed, trade reforms are not only unlikely to be undertaken, but they can be promptly reversed: Buffie (2001) cites at least

1 See Waldauer et al. (1996)

2 See section IV of Stewart (1755), emphasis added.

3 This depends on the price elasticity of imports and exports, as well as the ability of the economy and tax administrations to respond to altered incentives. Lowered tariffs reduce the incentive to smuggle and bring goods through the informal channels. Lower tariffs also stimulate increased imports. The nature of trade liberalization also matters: while a gradually reforming country with a moderate range of tariffs may lose revenue when it cuts them below a certain threshold, others that are still in the process of converting quotas into tariffs could have a revenue windfall.

12 episodes where revenue shortfalls triggered partial or full policy reversals in recent decades.[4]

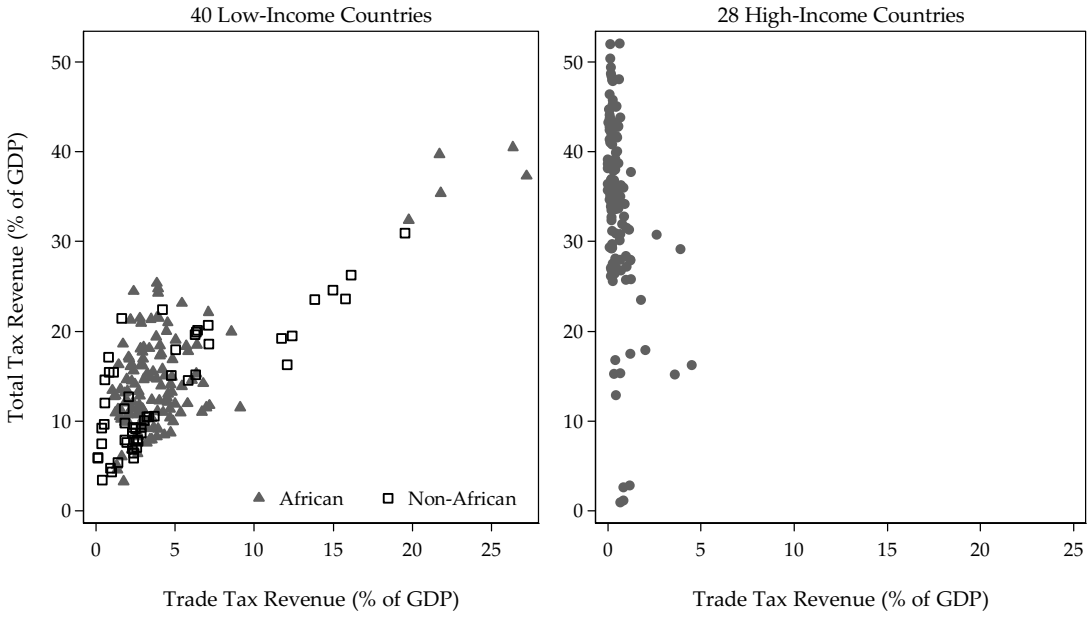
The conventional wisdom imparted in tax policy advice to developing countries over the past 30 years has been that domestic consumption or income taxes are superior to trade taxes because the former can meet the government's revenue target with lower rates, a wider base, and without a protectionist bias. This is underpinned by economic theory. Trade taxes introduce a wedge between foreign and national prices which distort the allocation of resources by encouraging activities in sectors that are viable only at prices above the world average. Dixit (1985) shows that small, open economies are better off reducing tariffs to zero and depending instead on destination-based consumption taxes.

As countries build capacities to extract tax revenue from income and domestic consumption, the importance of trade taxes as a source of government finance tends to decline.[5] Figure 1 depicts this starkly with trade taxes being a substantial portion of total tax revenues relative to Gross Domestic Product (GDP) in low-income countries, but negligible in high-income countries. In the 1950s, developing countries that are today classified as middle-income such as Colombia, Indonesia, Malaysia, Nigeria, Sri Lanka and Thailand derived more than 40 percent of government revenue from trade taxes (Lewis 1963; Corden 1997). By 1989, import duties as a share of total *tax* revenue in developing countries were nearly 25 percent, on average, but in developed countries only 2.7 percent (Burgess & Stern 1993). In 2009, customs and other import duties still accounted for more than 10 percent of tax revenue in at least 24 countries. A majority of countries that rely excessively on

4 Philippines (1991), Kenya (1983), Morocco (1987), Guinea (1990, 1992), Bangladesh (late 1980s), Malawi (1980s), Senegal (after 1989), Costa Rica (1995), Mexico (1995), Brazil (1995), Colombia (1996).

5 Corden (1997) offers reasons why trade taxes become a less important source of government revenue as countries become rich: i) collection costs of non-trade tax like income fall; ii) the capacity of manufactured import-competing industries improve reducing the need for tariffs for either protection or revenue; iii) as imports evolve from being associated with luxury to becoming part of the general population's consumption basket, the progressive tax function played by tariffs diminishes; and iv) the pattern of imports shifts away from final consumer goods to intermediate and capital goods, because tariffs on intermediate goods lower effective protection for final goods, and are therefore likely to be reduced.

Figure 1: Contribution of Trade Taxes to Total Tax Revenue



Source: Baunsgaard and Keen (2010)
Note 1: Each dot is a five-yearly average between 1982 and 2006

trade taxes belong to the group of 48 poor nations classified by the United Nations as Least Developed Countries (LDC).[6]

However, if countries embark on a path of radical trade liberalization without finding adequate sources of alternative domestic revenue, they can face fiscal difficulties. Many LDCs have not reached a development threshold where they can rely more on sophisticated tax instruments. They have weak tax administrations, as well as large informal sectors (with unrecorded or illicit transactions), narrowing the tax base.[7] Trade taxes also involve a lower cost of collection than other taxes. Such costs, as emphasized by Corden (1997), include i) administrative costs of the tax-collecting agency and ii) resource costs and distortions incurred by taxpayers

6 See United Nations (2011). This group includes 33 countries from Sub-Saharan Africa, 14 from the Asia-Pacific and one from the Caribbean. Fifteen of them are landlocked and nine are small island states.

7 Buehn & Schneider (2007) estimated the size of the informal sector to be 35.5 percent of official GDP, on average, in 76 developing countries, 36.7 percent in 19 transition countries, and 15.5 percent in 25 OECD countries in 2004-05. The burden of taxation is one of the factors that drives activities to become unofficial and unreported.

to minimize or evade payments, which if substantial could render trade taxes part of a *first*-best tax package.

In this paper, I combine trade theory, cross-national evidence, and an in-depth case study of a low-income country using a unique data set on all import transactions at the border in Nepal.[8] I find that low-income countries have had a mixed record of achievement in offsetting reductions in trade tax revenue. This is partly because of their weak enforcement of domestic taxes like Value-Added Tax (VAT). In principle, a strict enforcement of a positive, single-rated VAT with no exemptions is a highly effective form of modern taxation, and can negate substantial losses in tariff revenue. I confirm this by using a partial equilibrium model to simulate reforms using data from Nepal on tariffs and up to *ten* additional domestic taxes imposed on more than 400,000 import transactions between January 1 and December 31, 2008.[9]

The paper proceeds as follows. Section 2 uses panel data from selected low-income countries to assess whether they have succeeded in replacing trade taxes with domestic sources over a period of 25 years. Given the limitations for country-specific policy inference from cross-country regressions, sections 3 and 4 cover a country case study. Section 3 begins by adapting conditions for welfare-enhancing tariff cuts to a revenue-enhancing result from a *coordinated* tariff and tax reform in the presence of an informal sector. Two sets of plausible policy reforms are then simulated: i) different tariff cutting approaches are matched by domestic tax reforms with and without the assumption of a large informal sector; and ii) tariffs and other discriminatory charges on imports from members party to the Agreement on the South Asian Free Trade Area (SAFTA) are eliminated with and without Sensitive Lists that exempt a subset of products from tariff cuts.[10] I check for

8 "Border" in this paper refers to a generic port of entry. In many countries, a substantial share of imports arrives by air into cities that may not technically be on the border.

9 In 2009-10, 22.5 percent of the government's tax revenue was generated from tariffs on imports (Government of Nepal 2011).

10 Note that tariff cuts often take place as part of a broader package of trade policy reforms. Liberalization of trade policy implies more than tariff cuts, for example, the conversion of quotas into tariffs, elimination of tariff exemptions and trade-related subsidies, reform of state-trading monop-

robustness of results with different parameter assumptions of elasticities for product substitution among exporters, between exporters and domestic producers, and overall demand. Section 6 highlights two additional aspects of tariff reform. Section 6 concludes.

1.2 CROSS-COUNTRY EVIDENCE ON REVENUE RECOVERY

To set the stage for a detailed country case study subsequently, I examine in this section the cross-national evidence from a sample of 40 low-income countries on their record of replacing trade taxes with domestic sources over time. As trade taxes as a share of GDP have altered, how have poor countries fared in terms of domestic tax collection? In other words, for every dollar "lost" in trade taxes, how many cents have they recouped through domestic sources? A cross-national estimation of this nature requires a dynamic panel regression involving detailed tax data that are not always publicly available. I, therefore, use internally compiled IMF data and the estimation strategy of Baunsgaard & Keen (2010). I make three major changes to their data and specification (explained later) to derive results for revenue recovery by low-income countries that are comparable to, if not stronger than the estimations in Baunsgaard and Keen (2005, 2010).

1.2.1 *Econometric Model*

The basic econometric specification is as in equation (1.1) where the dependent variable is total domestic tax revenue (net of trade taxes) as a share of GDP (DT_{it}). Subscripts i and t indicate country and time, respectively.

$$DT_{it} = \alpha_i + \beta_o DT_{it-1} + \beta_1 TT_{it} + \beta_2' \mathbf{X_{it}} + \mu_t + \epsilon_{it} \tag{1.1}$$

olies, raising of low tariffs, elimination of export taxes, removal of foreign exchange rationing and import licensing regimes, among others. Often these are coupled with macro-economic reforms to influence exchange rates, inflation, and incentives for investment.

The main explanatory variable of interest is trade tax revenue relative to GDP (TT_{it}). If its coefficient β_1 is significantly negative, it can be concluded that a fall in trade taxes has been associated with a rise in non-trade tax revenue. In the long term, the relevant coefficient is $\frac{-\beta_1}{(1-\beta_0)}$. Time and country-fixed effects are captured by μ_t and α_i. The control variables ($\mathbf{X}_{it}$) are those that affect either the costliness of raising revenue from non-trade sources or the valuation of public expenditure. If the marginal value of public expenditures foregone with lost trade taxes is high, the urgency to seek alternative sources is greater. The control variabes are:

- GDP per capita: demand for government expenditures increases as average incomes of citizens grow (Wagner's Law). GDP per capita also proxies for administrative and institutional capacity in the country to collect and manage taxes. (Institutional capacity is proxied better by measures of the quality of governance like the World Governance Indicators (WGI), but their cross-national time-series does not go as far back as the 1980s.)

- Imports: it is the share of total imports relative to GDP. It captures "openness" of the economy as well as the fact that imports are a substantial part of the domestic tax base in poor countries. Baunsgaard & Keen (2010) use for openness a slightly broader measure: the share of exports and imports in GDP, citing Rodrik (1998) who finds this measure of openness to be closely associated with the size of government.

- Natural resources per capita: two measures are introduced as important controls to capture the fact that states that derive a large share of revenues from natural resources do not need to tax their citizens highly (Ross 2001).

- Foreign aid as a share of national income: this could have a perverse effect on the urgency of finding an alternative source of domestic revenue.

- Share of agriculture in GDP: this measures the size of the economy that is hard to tax, as well as the degree of informality prevailing in the economy.

- Inflation: reflects the extent to which revenue is generated from seigniorage, which needs to be controlled for.

- VAT: a modern VAT regime that is strictly enforced is associated with increased domestic revenue collection; however, a weakly enforced VAT system with widespread exemptions could be revenue-reducing compared to taxes collected at fixed border points.

1.2.2 *Data*

The IMF's Government Finance Statistics is the best publicly accessible source for cross-country data on tax revenue, but it is incomplete and suffers from mismeasurement. I therefore use the same panel data as that used by Baunsgaard & Keen (2010) who adjust the GFS data by cross-checking numbers with internal IMF figures obtained through ("Article IV") consultations with individual countries. They try to correct a common flaw in many countries where tariff and VAT revenues are conflated if they are both collected at the border. This would be problematic for the exercise in this paper because the aim is to find out whether decline in tariff revenues are made up for by domestic sources like VAT and excise.

I make three modifications to Baunsgaard and Keen's data set. First, their data on VAT is only a binary variable of whether the country had VAT in place in the year concerned. I use in its place actual ad valorem rates, compiled from three different sources as follows: Krever (2008), Ernst & Young (2008) and World Bank 2011*a*. Second, I confine my analysis to 40 low-income countries over a shorter time period of 25 years, from 1982 to 2006.[11] Third, I use two new measures for a country's abundance in natural resources as an additional explanatory variable. The first measure is the per capita natural resource-based exports (belonging to

11 Five countries drop out of the regression because of incomplete data on inflation and per capita income, as follows: Comoros, Guinea, Myanmar, Sao Tome and Principe, and the Solomon Islands.

SITC Section 3 and Division 27, 28 and 68).[12] Exports, however, could be misleading as a measure of natural resource abundance because a country that is too poor to consume its own natural resources exports much of its output, compared with a richer country which exports less but produces just as much. Therefore, I also use a second measure – oil and gas rents per capita – taken from the World Bank's Adjusted Net Savings data center.[13]

1.2.3 *Estimation Method*

I use four different estimation methods. The first method uses the fixed effects "within" estimator in equation 1.1 where the dependent variable – domestic taxes (net of trade taxes) – is regressed on a set of explanatory variables explained earlier. The fixed effects model removes the correlation between time-invariant unobserved effects and the explanatory variables. The main explanatory variable – tax revenue as a share of GDP – is, however, possibly endogenous. Both the collection of non-trade tax and trade tax revenues could, for example, be driven by a reformed customs administration.

The second method, therefore, addresses the potential endogeneity of trade tax by using instrumental variables which are its own first and second lags. Despite these corrections, a bigger problem in the first two models as specified in equation 1.1 is that the presence of the lagged dependent variable as one of the explanatory variables regressor (DT_{it-1}) renders the estimates inconsistent because of its correlation with the fixed effect, causing a dynamic panel bias (Nickell 1981). There could also be serial correlation in the error term. Roodman (2009) offers a useful guide on the use of dynamic panel estimators in these situations.[14]

12 These are primarily fuel, metals, and ores, whose total export values for the years 1982-2006 I obtained from partner country records in COMTRADE. Because the values are inclusive of cost, insurance, and freight (c.i.f.), I use an ad hoc coversion factor of 1.1 to bring them closer to their f.o.b. values.

13 See Bolt et al. (2002).

14 Roodman (2009) states that dynamic panel estimators are suitable in the following situations: (i) panels that have a relatively small number of years but large number of countries; (ii) the depen-

In the third method, I use the Generalized Method of Moments (GMM) estimation method of Arellano & Bond (1991). Equation 1.1 is transformed into its first-differenced self as in equation 1.2 to control for unobserved effects with lagged dependent and explanatory variables used as instruments.

$$\triangle DT_{it} = \beta_0 \triangle DT_{it-1} + \beta_1 \triangle TT_{it} + \beta_2' \triangle \mathbf{X_{it}} + \triangle \mu_t + \triangle \epsilon_{it} \quad (1.2)$$

The regression equation in differences (equation 1.2), however, is not satisfactory when the explanatory variables are persistent over time. In such situations, lagged levels of these variables are poor instruments, leading to biased coefficients (finite sample bias). An improved option is to use the linear GMM estimator of Arellano & Bover (1995) which combines the regression equation in differences and the regression equation in levels into one system (System GMM). In this method, bias is reduced by including more informative moment conditions. As explained by Blundell & Bond (2000), the equation in levels uses lagged first differences as instruments and the equation in first differences uses lagged levels as instruments. Next, I report results obtained from all four estimation methods.

1.2.4 *Results*

Column 1 of Table 1 reports the fixed effects estimates of the model.[15] The coefficient of trade taxes is not statistically significant, suggesting that the sample of 35 low-income countries included in the regression was not able to recoup lost trade tariffs with increase in domestic taxes. The coefficient on long term replacement (ω) is also not significant.[16]

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dent variable is affected by its own past realization; (iii) some explanatory variables are not strictly exogenous; (iv) there are fixed (country) effects; and (v) there is heteroskedasticity and autocorrelation within countries. My data and model satisfy all these criteria, thus justifying the use of GMM estimators. This approach is also taken by Baunsgaard & Keen (2010).

15 Hausman specification test rejects the assumption of random effects.

16 This is $\frac{-\beta_1}{1-\beta_0}$. The statistical significance of such a combination of coefficients is calculated by the "delta method" in Stata.

Column 2 reports Instrumental Variables (IV) estimates from the Two-Stage Least Squares (2SLS) model on equation 1.1. The coefficient on trade tax is negative and statistically significant at the 5 percent level. Although both trade tax and domestic tax variables are expressed relative to GDP, for a clearer insight into the magnitude of this coefficient, it could be said that for every dollar lost on trade taxes, low-income countries have recouped nearly 25 cents in the short run. In the long run, as indicated by ω, the recovery rate per dollar is nearly 74 cents.

The estimates in column 3 (Difference GMM) show that there a large recovery of trade tax in the short run (nearly 79 cents for each dollar lost) but not in the long term. This coefficient is significant at the 10 percent level, but it is likely to be biased. This is generally detected if the size of the coefficient of the lagged dependent variable obtained under a first-differenced GMM is smaller that obtained under the fixed effects model.

In Column 4 (System GMM), the coefficient on short-term recovery is statistically significant at the 1 percent level, suggesting that low-income countries recouped nearly 46 cents in the dollar.[17] Furthermore, the coefficient on the lagged dependent variable in System GMM lies between those obtained under fixed effects (0.69) and OLS estimations (not reported, but the coefficient is 0.89).[18] The tests of autocorrelation show that first order serial correlation is present but the second order serial correlation is not, as expected. These checks for the appropriateness of the model specification are in line with what Baunsgaard & Keen (2010) show.

Finally, column 5 reports System GMM estimates with oil and gas rent per capita as a control for natural resource wealth instead of the export per capita of oil, gas, ores, and metals that was used in column 4. The coefficient of short-term recovery of 32 cents to the dollar is statistically significant at the 5 percent level. In

17 The coefficient for long-term replacement is very high, at 2.18, but it is only significant at the 25 percent level.

18 This is reassuring because the OLS estimates are biased upwards and the fixed effects estimates are biased downwards.

Table 1: Recovery of Taxes in Low-Income Countries, 1982-2006

	(1)	(2)	(3)	(4)	(5)
	FE	IV	Diff. GMM	System GMM	
Lagged Total Tax Revenue	.694***	.665***	.658***	.830***	.758***
	(.034)	(.041)	(.115)	(.128)	(.082)
Trade Tax Revenue	-.045	**-.249****	**-.789***	**-.457*****	**-.320****
	(.069)	(.103)	(.442)	(.155)	(.126)
Share of Imports in GDP	.036**	.044***	.078***	.066*	.066***
	(.014)	(.016)	(.030)	(.037)	(.019)
Natural Resources Exports Per Capita	-.070	-.067	-.061	.023	
	(.080)	(.073)	(.108)	(.504)	
Oil and Gas Rent Per Capita					.010
					(.083)
Share of Agriculture in GDP	-.041*	-.046**	-.120***	-.044	-.049*
	(.023)	(.020)	(.040)	(.511)	(.026)
Share of Aid in GDP	-.010	-.003	-.001	-.027	-.020
	(.009)	(.010)	(.022)	(.132)	(.014)
Log of Inflation	.017	.046	-.165	.035	.080
	(.125)	(.114)	(.160)	(.733)	(.117)
Log of Per Capita GDP	-.371	-.071	1.705	-.822	-.545
	(.630)	(.609)	(2.699)	(15.637)	(.771)
VAT	.026*	.027**	.051***	.027	.006
	(.013)	(.013)	(.019)	(.135)	(.019)
Long term replacement (ω)	0.148	0.74***	2.31	2.69	1.32***
	(0.225)	(0.241)	(1.43)	(2.62)	(0.638)
Serial correlation (1st order)			-3.24***	-3.05***	-3.22***
Serial correlation (2nd order)			0.44	0.77	0.61
No. of observations	645	643	567	645	672
Adj. R-sq.	.87	.86			
Time dummies	Yes	Yes	Yes	Yes	Yes
No. of countries	35	35	35	35	35
No. of instruments	35	35	35	38	38

Note 1: robust standard errors in parenthesis

Note 2: statistical significance indicated as * for p<0.1, ** for p<0.05, and *** for p<0.01

Note 3: coefficient of the lagged dependent variable in an OLS model (not shown) is 0.89

this regression, the coefficient of the long-term recovery (US$1.32 for every dollar) is also highly significant.

In sum, the estimates from the System GMM models of tax recovery in low-income countries – between 32 and 46 cents to the dollar – in the short run and 132 cents to the dollar in the long run are higher than those found in two previous studies with different specifications and years under consideration. Baunsgaard & Keen (2010) found a recovery rate of between 20 and 25 cents for low-income countries, and Baunsgaard & Keen (2005) found for only one of the models a recovery estimate of about 30 cents for each dollar lost.

The IV and the Difference GMM models also find the VAT coefficient to be statistically significant, that is, it was associated with fast positive tax recovery. The VAT coefficient, however, is not significant in the System GMM regressions. That the significance of coefficients of all VAT dummies is not consistently stronger leads to the inference that not all VAT regimes are alike. An attempt to assess the role of VAT regimes in revenue recovery by just looking at the applied ad valorem rate is perhaps incomplete. Their efficacy depends crucially on how they have been introduced along the following dimensions: i) the number and level of the rates; ii) share of products that are exempted; iii) income threshold above which the tax applies; iv) coverage of the retail sector and services; and v) effectiveness of the refund system (Keen & Lockwood 2010).[19]

Among other variables, total imports relative to GDP (a proxy for openness) are consistently associated with high rates of domestic tax collection. This is not surprising because imports are a significant part of the VAT base in low-income economies. Contrary to expectations, coefficients of variables measuring natural resource abundance are not significant in any of the estimations. Coefficients of inflation and overseas aid are not statistically significant, whereas those on per

19 As confirmed by policy simulations in subsequent sections of this paper, however, a basic rule of thumb is that a broad-based VAT that has a uniform rate and little or no exemptions raise more revenue. Exemptions generally have no investment-promotion effect, and merely offer conducive fiscal loopholes for tax evasion and avoidance (Tanzi et al. 2008).

capita income and the share of agriculture have the expected signs in selected regressions.

There are caveats to this analysis. In addition to the methodological complexity in asserting a precise relationship between lost trade taxes and domestic taxes, all indirect effects through which control variables like GDP or openness may generate tax revenue over the long run are not analyzed. Indeed, this section of the paper should not be seen as a definitive analysis of the impact of trade liberalization on revenue, but rather as shedding light on what has happened to the share of domestic taxes in GDP across an imperfect sample of poor countries when – for whatever reason – import duties change relative to GDP.

Furthermore, to accurately assess and forecast the likely impact of reforms, there is greater need for nuanced country-specific case studies. The case for the use of in-depth country-specific case studies to understand policy regimes is best articulated by Bhagwati & Srinivasan (1999). They find several problems with cross-country regressions as a method of policy evaluation. Even if the theoretical, data and methodological weaknesses inherent in most cross-country regressions were ignored, the cross-country results, after all, only indicate *average* effects. In view of these shortcomings, I focus next on a detailed country case, of Nepal, where tariffs still constitute more than one-fifth of total tax revenue, and the vast majority of its 30 million people are employed in the largely untaxed agricultural and informal sectors.

1.3 JOINT TRADE-FISCAL REFORM: A CASE STUDY

My contribution in this section is to simulate the revenue consequences of joint trade-fiscal reforms with actual data on import, tariffs, excise duty, value-added tax and para-tariffs from Nepal. I also assess how these reforms change the price and production of domestic manufactures. Because it is often the perceived loss of

immediate revenue that leads stakeholders to resist trade reforms in poor countries, the focus is on short-term impacts.

The academic literature on coordinated trade and fiscal reforms in Nepal is scant. Khanal (2006) finds econometrically that trade reform in Nepal over the period 1990-2005 did not lower trade tax revenue. Cockburn (2006) uses a Computable General Equilibrium (CGE) model to study the poverty impact of tariff elimination. His innovation is to incorporate household data in the model to capture complex income and consumption effects. When tariffs are eliminated but compensated by a uniform 1.1 percent increase in consumption tax, he shows that urban poverty falls and rural poverty increases because initial tariffs protected agriculture.

1.3.1 *Theoretical Motivation*

In an economy with multiple distortions, reduction of one or a subset of distortions (such as tariffs) may not lead to Pareto welfare gains. This is the essence of the theory of second-best launched by Meade (1955) and Lipsey & Lancaster (1956). Welfare may also not be increasing in the number of reforms that are undertaken because of second-best interactions, except when *all* distortions are simultaneously reduced. However, it is impossible to know all distortions and their cross-effects. The challenge in trade policy reform, therefore, is to "design small, feasible changes in the existing tariff structure that will result in a welfare improvement when the first-best policy of free trade is not feasible" (Turunen-Red and Woodland 1993, p. 145).[20]

A more realistic objective of governments is to maximize revenue which can be used in ways to improve national welfare. When the condition that revenue

20 An example of such a feasible change is to remove the biggest distortions first ("Concertina" tariff reform rule). As shown by Bertrand & Vanek (1971), Hatta (1977) and Lloyd (1974), if the highest tariff is reduced to the next highest level, welfare can improve if the good whose tariff is being cut is a gross substitute of all other goods. The other well-known rule is the "proportionality rule" which shows that if all tariffs are reduced proportionally, welfare can be increased.

should not fall when undertaking tariff reform is imposed, the welfare-enhancing result of a simple tariff cut is weakened (Falvey 1994). The policy challenge, then, is to undertake tariff reforms in ways that do not reduce welfare *and* revenue. Keen & Ligthart (1999) suggest that any trade tax (tariff) cut that is offset point-for-point by an increase in consumption (domestic) tax that leaves consumer prices unchanged can achieve this goal to some extent.

This evolving consensus on the desirability of revenue-neutral reforms that involve replacing tariffs with value-added tax in developing countries is contested by Emran & Stiglitz (2005). They show that in the presence of an informal sector where economic activities normally go untaxed, such coordinated reforms can prove to be welfare reducing. They find that the threshold of the VAT base of a commodity below which welfare falls is low if the good whose tariff has been cut belongs to the informal sector. In other words, a reduction in tariff of good k reduces its consumer price and leads to expanded demand for good k. However, if the good is not produced in the formal sector, the government does not receive increased VAT receipts from the sale of good k.[21]

The foucs of Emran & Stiglitz (2005) is on the conditions required for *welfare* to increase in the presence of an informal sector. In what follows, I adapt their framework to identify conditions for *revenue* to increase in the presence of an informal sector, following a coordinated tax and tariff reform that keeps welfare intact.

Assume a small open economy with a representative consumer that imports products at world price (p^w) before imposing tariffs. There are no externalities. All $(n+1)$ goods are produced using a convex, constant-returns-to-scale technology. There is an informal sector (s) which does not pay consumption tax (v), so price in this sector is q^s. In the formal sector, domestic price (q^f) is inclusive of both the tariff (t) and the consumption tax (v). There are four subsets of commodities,

21 The Diamond-Mirrlees theorem states that from the point of view of production efficiency, a small country should not discriminate between domestic and international supply of identical goods. Munk 2008 argues that when tax collection is administratively costly, this theorem fails to hold.

importables and exportables, produced in the formal (f) and informal sectors as follows. Informal exportables that face no tariff or tax are the numeraire.

$$\begin{cases} \mathbf{q^f} = \mathbf{p^w} + \mathbf{t^f} + \mathbf{v} : \text{consumer price in the formal sector} \\ \mathbf{q^s} = \mathbf{p^w} + \mathbf{t^s} : \text{consumer price in the informal sector} \\ \mathbf{p^f} = \mathbf{p^w} + \mathbf{t^f} : \text{producer price in the formal sector} \\ \mathbf{p_o} = \mathbf{q_o} = \mathbf{1} : \text{numeraire} \end{cases}$$

The representative consumer is unsatiated, owns all the factors, and maximizes a quasi-concave utility function. The expenditure function minimizes her consumption expense to attain a given utility (u) facing a price vector $(q_o,\ q)$. The function is twice differentiable, non-decreasing and concave in q, and homogeneous of degree one.

$$E(q_0,\ q,\ u) \quad = \quad \min_{\{c\}} \{p.c \ \text{ such that } u(c) \geqslant u_0\} \tag{1.3}$$

Production is represented by a GNP function, $G(p_o,\ p,\ y)$, which maximizes the value of output facing a price vector $(p_0,\ p)$. The function is twice differentiable, non-decreasing and convex in p, and homogeneous of degree one in p. It is non-decreasing and concave in y.

$$G(p_0,\ p,\ y) \quad = \quad \max_{\{x\}} \{p.x \ \text{ such that } x(y) \text{ is feasible}\} \tag{1.4}$$

By Shephard's Lemma, E_q is the consumption vector.

By Hotelling's Lemma, G_p is the net output vector.

The net import vector, m, is $E_q(q,\ u) - G_p(p,\ y)$.

The government's revenue, R, is raised from tariffs $(t'm)$ and VAT $(v'E_{q^f})$:

$$R(t,\ v) \quad = \quad t'(E_q - G_p) + v'E_{q^f} \tag{1.5}$$

Private budget constraint is:

$$E(q_o, q, u) = G(p_o, p, v) + R(t, v) \tag{1.6}$$

From equation 1.6, when tariff on good k is reduced and VAT on good i is increased, we get:

$$\begin{aligned} dR &= E_{q_k} dq_k + E_u du + E_{q_i^f} dv_i - G_{p_k} dp_k \\ E_u du &= dR - (E_{q_k} - G_{p_k}) dt_k - E_{q_i^f} dv_i \\ E_u \frac{du}{dt_k} &= \frac{dR}{dt_k} - (E_{q_k} - G_{p_k}) - E_{q_i^f} \frac{dv_i}{dt_k} \end{aligned} \tag{1.7}$$

Differentiating equation 1.5, we get:

$$\begin{aligned} (E_{q_k} - G_{p_k}) dt_k + t'[E_{qq_k} dq_k + E_{qu} du + E_{qq_i^f} dv_i - G_{pp_k} dp_k] \; + \\ E_{q^f} dv_i + v'[E_{q^f q_i^f} dv_i + E_{q^f u} du + E_{q^f q_k} dt_k] \; = \\ dR \end{aligned} \tag{1.8}$$

$$\begin{aligned} \left[(E_{q_k} - G_{p_k}) + v' E_{q^f q_k} + t'(E_{qq_k} - G_{pp_k})\right] dt_k \\ + \left[t' E_{qq_i^f} + v' E_{q^f q_i^f} + E_{q^f}\right] dv_i + \left[t' E_{qu} + v' E_{q^f u}\right] du \; = \\ dR \end{aligned} \tag{1.9}$$

Definition 1. Let ψ_i, be the marginal effect of a change in v_i on total indirect taxation; and let ψ_k be the marginal revenue effect of a change in t_k. Then $\psi_i = t' E_{qq_i^f} + v' E_{q^f q_i^f} + E_{q_i^f}$ and $\psi_k = (E_{q_k} - G_{p_k}) + v' E_{q^f q_k} + t'(E_{qq_k} - G_{pp_k})$.

Both ψ_i and ψ_k are assumed to be greater than zero.

From equation 1.9 and Definition 1:

$$\frac{dv_i}{dt_k} = -\psi_i^{-1} \left\{ \psi_k + [t' E_{qu} + v' E_{q^f u}] \frac{du}{dt_k} - \frac{dR}{dt_k} \right\} \tag{1.10}$$

Substituting equation 1.10 in equation 1.7:

$$
\begin{aligned}
-(E_{q_k} - G_{p_k}) - E_{q_i^f}\left[-\psi_i^{-1}\left\{\psi_k + [t'E_{qu} + v'E_{q^f u}]\frac{du}{dt_k} - \frac{dR}{dt_k}\right\}\right] &= \\
E_u \frac{du}{dt_k} \qquad (1.11)& \\
\left\{E_u - E_{q_i^f}\psi_i^{-1}\left[t'E_{qu} + v'E_{q^f u}\right]\right\}\frac{du}{dt_k} + (E_{q_k} - G_{p_k}) &= \\
E_{q_i^f}\psi_i^{-1}\left[\psi_k - \frac{dR}{dt_k}\right]& \\
-E_{q_i^f}\psi_i^{-1}\frac{dR}{dt_k} + E_{q_i^f}\psi_i^{-1}\psi_k - (E_{q_k} - G_{p_k}) &= \\
Q\frac{du}{dt_k} \qquad (1.12)&
\end{aligned}
$$

In equation 1.12, $Q = \left\{E_u - E_{q_i^f}\psi_i^{-1}\left[t'E_{qu} + v'E_{q^f u}\right]\right\}$, and is assumed to be greater than zero for uniqueness and stability (Hatta Normality Condition). Assume further that the tax-tariff reform is welfare neutral (that is, $\frac{du}{dt_k} = 0$). For revenue increase $\frac{dR}{dt_k} < 0$, and $E_{q_i^f}\psi_i^{-1} > 0$. So, from equation 1.12, the condition for welfare-neutral revenue increase is:

$$
\begin{aligned}
(E_{q_k} - G_{p_k}) &< E_{q_i^f}\psi_i^{-1}\psi_k \\
(E_{q_k} - G_{p_k})\frac{\psi_i}{\psi_k} &< E_{q_i^f} \\
(E_{q_k} - G_{p_k})\frac{t'E_{qq_i^f} + v'E_{q^f q_i^f} + E_{q_i^f}}{\left\{(E_{q_k} - G_{p_k}) + v'E_{q^f q_k} + t'(E_{qq_k} - G_{pp_k})\right\}} &< E_{q_i^f} \qquad (1.13)
\end{aligned}
$$

Assume that the cross-price effects are zero, that is, $E_{q_i q_j} = 0$. And let $\delta_k = (E_{q_k} - G_{p_k}) > 0$ as k is an importable. Then equation 1.13 simplifies to:

$$
\delta_k\left\{\frac{(v_i + t_i^f)E_{q_i^f q_i^f}}{v_k E_{q_k q_k} + t_k(E_{q_k q_k} - G_{p_k p_k})}\right\} < E_{q_i^f} \qquad (1.14)
$$

For revenue to increase in response to a welfare-neutral fall in tariff of good k and an increase in VAT of good i, equation (1.14) requires the latter's VAT base to exceed a certain threshold. The threshold is higher if good k is in the informal sector because when $v_k = 0$ the denominator becomes smaller. Note that the reduction in t_k decreases the consumption price q_k and increases the domestic

consumption of good k, raising revenue through the VAT, v_k. However, when the good is in the informal sector, there is no increase in revenue from increased consumption. If the VAT base of formal goods is small (that is, the informal sector is large), revenue following a coordinated tariff and tax reform could decrease. This theoretical postulate guides the analysis of the revenue implications of tax policy reform in Nepal, a country with a large informal sector that is hard-to-tax.[22]

1.3.2 *Simulation Model*

The empirical analysis in this section draws on simulations conducted using the TRIST developed by the World Bank (Brenton et al. 2011). It uses a partial equilibrium model that quantifies the effect of trade reform scenarios on imports, revenue and production (please refer to the appendix) for the simulation model and an illustration). The model makes the following key assumptions: (1) it is derived from standard consumer theory and elasticities play a central role in determining the magnitude of demand response to price change; (2) there is imperfect substitution between imports from different countries, following Armington (1969), and each product is modeled as a separate market; (3) the economy is small and open such that all changes in tariffs are passed on, but change in demand by consumers in the small country does not affect world prices.

Percentage change in the price of good j from country i (Δp_{ij}) when tariff and other domestic taxes are lowered is as follows: the prime indicates post-reform values of tariff (τ), excise duty (e) and the VAT (v).

$$\Delta p_{ij} = \left[\frac{(1+\tau'_{ij})(1+e'_{ij})(1+v'_{ij}) - (1+\tau_{ij})(1+e_{ij})(1+v_{ij})}{(1+\tau_{ij})(1+eij)(1+v_{ij})} \right] \quad (1.15)$$

22 Keen (2007) argues that the theoretical result of Emran & Stiglitz (2005) does not fully take into account the efficacy of VAT as a taxation device. It is not just a tax on final consumption, but a charge on all imports and sales at every stage of transaction (with credit or refund given to registered taxpayers of VAT). Thus, while the informal sector can evade income tax, it can only escape from VAT partially, for it acts like a tax on all purchases the informal sector makes from the formal sector. This point is valid, but does not alter the basic thesis that, all else being equal, domestic tax collection is decreasing in the size of the informal sector.

Demand responds to the relative price change in three steps, as explained by Lim & Saborowski (2010) and Brenton et al. (2011). *First*, shares of expenditure on imports of a product across different exporting countries change when a particular tariff is altered. Total imports remain the same, but if imports of Country A become cheaper, there will be substitution away from imports from other countries. The elasticity of substitution is calculated as follows:

$$\left[\frac{\triangle(M_A/M_B)}{(M_A/M_B)}\right] \quad / \quad \left[\frac{\triangle(P_A/P_B)}{(P_A/P_B)}\right] \tag{1.16}$$

where M_A, M_B are the same imports from Countries A and B with prices P_A, P_B, respectively.

Second, the allocation of expenditure between imports and domestically produced goods is calculated. Relative demand changes are derived from changes in the weighted average of the price of imports, adjusted by the elasticity of substitution between domestic and foreign products. If the average price of imports falls, there will be substitution away from domestically produced goods, but total consumption stays the same. *Third*, when average domestic price changes, there will be an overall demand response. Consumers demand more of the good whose price has fallen irrespective of whether it is imported or procured locally.

By definition, the partial equilibrium model has no economy-wide, intra- or inter-sectoral linkages. This does not pose a problem here because the purpose is to analyze the impact of tariff and tax changes on *revenue* in the *short-term*. It is not to judge whether policy changes are beneficial from an economy-wide perspective over the long run for which a CGE model would probably be more suitable. However, in contrast to the tractability of partial equilibrium models, CGE models require a complex data set, a large number of exogenously imposed parameters, and restrictive assumptions rendering the replicability and falsifiability of results difficult.[23]

23 See Taylor & Von Arnim (2007) for a critique of the CGE methodology.

1.3.3 *Data*

The empirical analysis uses a new data set extracted from unpublished customs records from Nepal for the calendar year 2008. It contains 417,715 import transactions. In addition to the date when the import shipment was processed, the data set lists the value of each import in Nepali Rupees inclusive of cost, insurance and freight (c.i.f.) and tariffs levied on that import. Customs also raise a substantial share of additional revenue at ports of entry by levying a range of domestic taxes. The main ones in Nepal are the excise duty and VAT, as well as the Agricultural Reform Fee (ARF) imposed on agricultural imports from India only. A range of other charges and taxes (para tariffs) are levied as follows: demurrage, customs service fee, fine, special fee, Road Construction Fee, and the Local Development Tax.[24] The data set lists applied Most Favored Nation (MFN) and preferential tariff rates set for each import at the Harmonized Commodity Description and Coding System (HS) 8-digit level.

I check for the consistency of entries and adjust the data set as follows. All import transactions worth Rs. 10,000 (approx. US$140) or less are dropped.[25] Goods entering the country under customs procedure codes which do not compete in the local market are dropped. These are mainly diplomatic and governmental imports that are tax-exempt. Next, I compute the applied tariff rate, applied excise duty, and applied VAT by dividing the actual amount of such taxes collected by their respective base.[26] Those "applied" values that abnormally deviate from the statutory

24 As of 2011, the local development tax, road construction fee, and special fee have been phased out.

25 This excludes nearly 30 percent of the observations, which accounts for 3.2 percent of total import value.

26 In Nepal, excise duty is levied as a percentage of import value. VAT is paid as a percentage of the base comprising of import value plus excise and other taxes. The Agricultural Reform Fee (ARF) is levied (in lieu of tariff) on the value of agricultural imports from India. If VAT is additionally levied on such agricultural goods from India, it is a fixed percentage of the import value, *not* import value plus the ARF.

tax rates are dropped. The cleaned data set that is ready for simulation consists of 265,194 import records spanning 4032 tariff lines from 133 economies.[27]

The paper also incorporates domestic production data extracted from the latest quinquennial Census of Manufacturing Establishments that reports the domestic sale of manufactured goods (Government of Nepal 2008). For 3,079 of the 4032 import codes, there exists matching data for domestically sold products. This allows for substitution of imports by domestically produced goods when the price of imports rises, adding to the richness of simulation results. There are, however, two limitations. First, the latest production data are available only up to the fiscal year 2006-07, whereas the import data straddles the fiscal years of 2007-08 and 2008-09 (that is, calendar year 2008). Second, production data covers only manufacturing industries. For a little less than 25 percent of the tariff lines that belong to non-manufacturing industries, there are no data on domestic production. In the language of the model, for a subset of imports, the substitution between imports and domestically produced goods is *perfectly* inelastic.

The 133 import trading partners of Nepal in 2008 are organized in eight groups: (1) India; (2) China, including the Tibet Autonomous Region; (3) Rest of South Asia (Afghanistan, Bangladesh, Bhutan, Maldives, Pakistan, Sri Lanka); (4) Northeast Asia (Japan, Republic of Korea, Hong Kong Special Administrative Region, and Taiwan); (5) Southeast Asia (Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam); (6) North America (Canada, Mexico, United States); (7) the European Union; and (8) the Rest of the World (ROW). The baseline scenarios assume an export substitution elasticity of 1.5, domestic substitution elasticity of 1, and import demand elasticity of 0.5.

27 The term "economies" is used in lieu of "countries" because Nepal's customs data treat Tibet, Hong Kong, and Taiwan as sources of imports that are distinct from the People's Republic of China even though the three economies are (politically) part of China.

1.3.3.1 *Import-based Revenue in Nepal*

The structure of tariffs and tariff-based revenue in Nepal is described in this section. Columns 3 to 6 in Table 3 show that the collected tariff and VAT rates across all imports are just over 10.5 percent and 11 percent, respectively. When imports are weighted by value, those rates drop to 7 and 9.9 percent, respectively. That the applied VAT rate of above 11 percent is nearly two percentage points below the statutory rate of 13 percent indicates the scale of average exemptions, a proxy for discretion that the authorities exercise. For tariffs, the scale of average exemptions is the difference between the weighted statutory tariff rate of 8.33 percent and the applied tariff rate of 7 percent.[28] Compared to just 20 years ago, the height of trade protection has fallen considerably, although revenue generated by taxing imports through tariffs, VAT and excise continues to be the dominant source of tax revenue in Nepal.

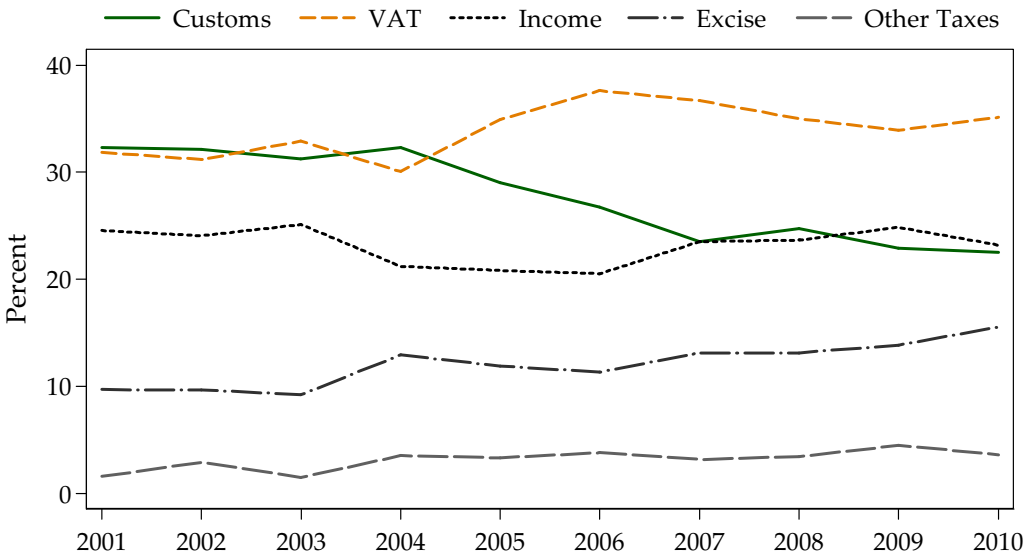
After the adjustments described in the preceding section are made, the total value of imports in 2008 is Rs. 222.19 billion.[29] Table 3 shows that in 2008, Nepal received Rs. 15.6 billion in tariff revenue, amounting to 34.3 percent of total revenue derived from imports. VAT on these imports (Rs. 23.9 billion) accounted for 52.7 percent of the total import-based revenue, and the remaining 13 percent was accounted for by excise and other taxes amounting to nearly Rs. 6 billion.

Figure 2 shows that VAT (on both imports and domestic consumption) surpassed customs-based revenue as the main source of tax revenue after 2004. How-

28 The extent of exemptions granted can only be assessed for products subject to ad valorem duties. Because the AVE for specific tariffs have been computed by the so-called income method of taking the (median) applied tariff rate, there is no difference between the statutory and collected tariff rates for the category of imports that face specific tariffs.

29 This figure is for the calendar year 2008. Its comparison with total import figures for the fiscal year 2008 deserves care. The reported total import by Nepal in the fiscal year (from July 2008 to July 2009) was Rs. 284.5 billion. In the fiscal year 2007-08 (from July 2007 to July 2008), total import was Rs. 221.9 billion. The raw customs total for the calendar year 2008 is in between the figures for the two fiscal years, at Rs. 236.6 billion. After adjustment, this drops to Rs. 222.2 billion.

Figure 2: Share of Tax Revenue by Source



Source: Government of Nepal (2011)
Note 1: Customs includes import tariffs, export duties, Indian Excise Refund

ever, as shown in Table 4, at least 62 percent of total VAT revenue is derived from imports.[30]

Table 5 shows the distribution of observations by tariff bands ranging from zero to 80 percent for SAFTA and non-SAFTA trading partners. There is an additional row for products (such as fuel, tobacco, alcohol and cement) that face specific tariffs (that is, per quantity, not percentage of value). The first group comprises countries that generally pay a higher rate of applied MFN tariff. The second group of countries pays preferential tariff rate under SAFTA. This group accounts for nearly 64 percent of imports into Nepal, and is almost exclusively dominated by India.

Several features stand out in Table 5. First, less than 15 percent of imports (by value) are free of statutory duty. Second, nearly 36 percent of imports are subject to "nuisance" tariffs between zero and five percent; the term indicates that at such

30 Data from the Internal Revenue Department of the Ministry of Finance of the Government of Nepal as published in Government of Nepal (2004), Government of Nepal (2009) and Government of Nepal (2010) show that VAT revenue from imports has exceeded 60 percent over the past 10 years.

low rates the cost of monitoring and collecting tariffs could outweigh the revenue collected. Third, there are 421 observations that are subject to specific tariffs, whose Ad Valorem Equivalent (AVE) is 26 percent. The AVE of specific tariffs is calculated as the median applied tariff rate of all applicable imports at the HS 8-digit level (that is, customs tariff divided by import value). Almost all the goods on which specific tariffs are levied originate in India. These goods account for 19.2 percent of total import value and 22.6 percent of collected tariffs.

1.3.4 *Results*

1.3.4.1 *Coordinated Tariff and Tax Reform with Small Informal Sector*

This section reports results of the impact of five reform scenarios of coordinated tariff cuts and VAT consolidation. In the first scenario, statutory tariffs on all imports are cut by 50 percent, together with a full enforcement of the VAT at the existing 13 percent.[31] Full implementation means that all imports and domestically produced goods are charged a non-discriminatory VAT rate of 13 percent with no exception. All "other" taxes and charges including the Agricultural Reform Fee, fines and demurrage are eliminated.[32]

The essence of this reform is to reduce significantly the distortionary trade tax and recoup potential tariff losses by plugging exemptions on a much wider VAT base. In scenario 1 of Table 6, total imports *increase* by 0.3 percent in value. Note that this appears to be a small response to such a drastic cut in tariffs. However, cuts in tariff have been accompanied by an indiscriminate application of the VAT. This could, in some cases, raise the domestic price of the good even though the

31 Note that the statutory tariff rates are applied MFN or preferential rates. They are not bound MFN rates.

32 Nepal has already announced that it would phase out the ARF.

trade-weighted applied tariff rate drops from 7 to 4.3 percent. This suggests that there is substitution away from domestic production.

The 50 percent cut would not "bite" if some imports were currently being charged less than the statutory tariff rate because of discretion exercised by customs authorities, corruption, or temporary government exemptions. In scenario 1, tariff revenues drop by 38.3 percent, as expected, from Rs. 15.6 billion to Rs. 9.6 billion. The VAT compensates for the tariff loss even when other domestic taxes/charges are eliminated. VAT revenue on imports increases from Rs. 23.9 billion to Rs. 30.6 billion, and VAT revenue on domestically produced goods increases from Rs. 10.7 billion to Rs. 13.6 billion (not shown in a disaggregated manner in the table). Overall, this reform that cuts tariffs by half and enforces the existing VAT ends up being more than revenue-neutral: total revenue goes up by 1 percent, while domestic production suffers a modest loss of 0.14 percent.

In scenario 2, I apply a uniform tariff rate of five percent on all imports from all countries and match that, again, with full implementation of the existing VAT rate of 13 percent and elimination of all other taxes/charges. The tariff cuts are less biting than in scenario 1, because existing tariffs that are already less than 5 percent are increased to five percent. This affects nearly 17 percent of tariff lines, and tariff revenue from this subset increases. However, tariff revenue from products on which the existing tariff rate exceeds five percent is likely to decline. The net effect of this reform on tariff revenue is a loss of 28.9 percent. When the VAT is levied on all imports, the final decline of total tax revenue from imports is from Rs. 45.4 billion to Rs. 44.1 billion. This modest loss is more than made up for by the VAT imposed on domestic products. Overall tax revenue from imports and domestic sales under the second scenario increases by 2.7 percent.

In scenarios 3 and 4, the VAT rate is increased to 15 and 17 percent, respectively. As expected, total revenues increase by 13.3 and 23.7 percent. In scenario 5, I simulate another radical combination of complete full trade with no tariff on any import, matched by a flat VAT of 17 percent on all goods. This leads to a drop in

tariff revenue from Rs. 15.6 billion to zero; however, total effect on revenue is a net increase of 4 percent.

The message from the simulation results reported in Table 6 is that trade taxes can be reduced without adversely affecting total government revenues by implementing domestic taxes like VAT and excise duties effectively. In fact, if tariffs are used mainly for revenue-raising purposes (that is, not used to protect domestic industries) they could simply be replaced by excise taxes. Like VAT, excise taxes do not discriminate between domestic and international sources. They also do not fall under the purview of trade agreements, so countries under pressure to cut tariffs can simply switch to excise. This would just be a semantic change in nomenclature.

There is, however, a powerful assumption behind the advocacy of a switch in tax regime from tariffs to a broad-based consumption tax, namely, that countries have the capacity to enforce a complicated system like the VAT. One of the main arguments for reliance by poor countries on tariffs has always been that they are easier and less costly to collect at fixed border points.

As postulated in section 2, we need a larger VAT base to raise the same level of revenue in the presence of an informal sector. Piggott & Whalley (2001) show that VAT expansion can reduce welfare if it encourages suppliers to go underground to evade new taxes. The presence of the informal sector, however, may not dent revenue collection to the extent that the theory suggests. This is because a substantial share of revenue in poor countries is generated from VAT on imports which is usually collected at the border together with tariffs. In the Nepali data for 2008, for every rupee collected in tariff revenue, Rs. 1.7 was collected additionally in VAT and excise duty. This point is also made by Keen (2008) that the VAT (and withholding taxes) on imports actually acts as a tax on the informal sector. While the formal sector may claim tax credit on payments made at the border when they eventually pay income and other taxes, the informal sector does not, thereby minimizing loss to the exchequer.

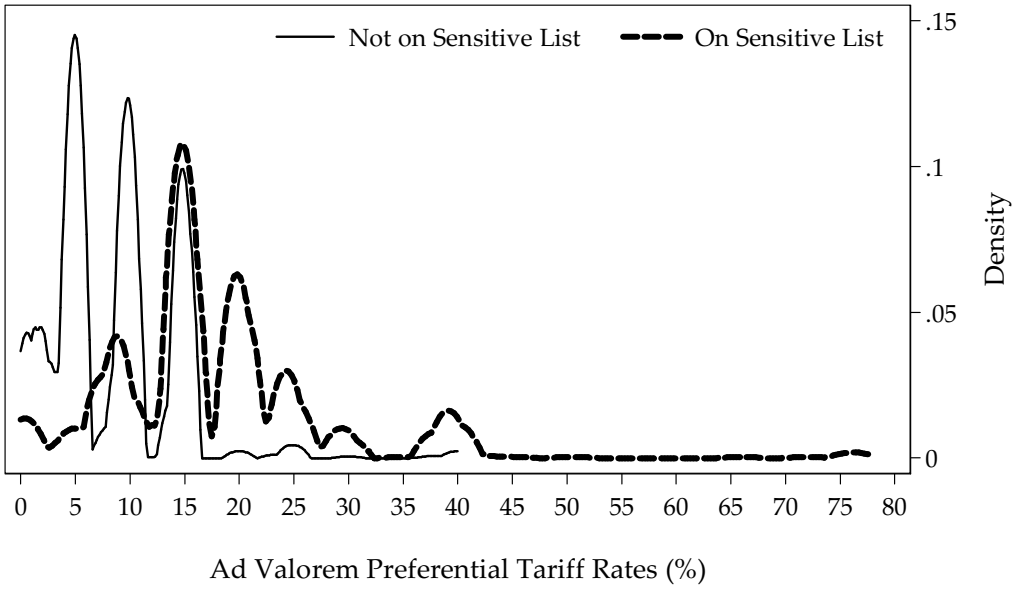
1.3.4.2 *Coordinated Tariff and Tax Reform with Large Informal Sector*

In this subsection, I allow for an exogenous shrinking of the taxable production base (Table 7), which is equivalent to the enlargement of the informal sector. In section 2 of this paper, it was shown that the presence of a large informal sector makes it difficult to raise revenue from domestic sources. To proxy for the informal sector, I run the same simulations as in Table 6, but with the assumption that the taxable domestic base has shrunk by 30 percent.

In scenario 1 presented in Table 7, the same policy simulation as in scenario 1 in Table 6 leads to a drop in overall revenue by 0.6 percent. This is because the VAT is levied on a smaller production base (with activities going underground in response to the commodity tax hike). In scenarios 2, 3 and 4 with a uniform tariff of 5 percent matched by increasing rates of VAT, the net increase in total revenue is less than in Table 6 for identical simulations. While scenario 5 raised total tax revenue by 4 percent, as in Table 6, the increase in revenue is only 0.5 percent in the presence of an enlarged informal sector.

Ideally, the size of the informal sector ought to respond endogenously to the tax system. However, discussion of this is beyond the scope of this section whose the goal is to illustrate that i) it is costly to raise taxes on a narrow base and ii) revenue loss from a switch in trade to domestic commodity taxes is minimized when imports form an important part of the domestic tax base. In extreme cases, such a coordinated tariff and tax reform could merely lead to a replacement of tariff by VAT and excise at the border. There will, however, be a substantial difference made to production efficiency in the formal sector by switching to VAT and excise. Furthermore, while the VAT generally only taxes the informal sector if it consumes inputs from the taxed formal sector, this is not the case when imports are a large part of the VAT base when it can tax informal sector sales, as well as profits of formal sector firms (Boadway & Sato 2009).

Figure 3: Dispersion of Tariff Rates



Source: Department of Customs, Nepal

1.3.4.3 *Regional Free Trade without Sensitive Lists*

The second set of policy scenarios addresses the Tariff Liberalization Program, as spelled out in Article VII of SAFTA, launched in 2006 with the aim of establishing a free trade zone among the eight countries of South Asia (SAARC 2006).[33] What is foreseen by SAFTA is a preferential area where most goods would be traded at tariff levels between zero and five percent by 2016. Pakistan, India and Sri Lanka are not Least Developed Countries (LDCs) according to a United Nations definition,[34] and they follow a faster schedule of tariff liberalization than the other five, with tariffs reduced to at most five percent by 2013.

All members of SAFTA are permitted to maintain a Sensitive List (SL) of exports that are exempt from tariff cuts. This is often at odds with the WTO's General Agreement on Tariffs and Trade (GATT) that sets out rules for the negotiation of

33 The members are Afghanistan, Bhutan, Bangladesh, India, Maldives, Nepal, Pakistan and Sri Lanka.

34 See United Nations (2011).

customs unions and free trade areas. Article XXIV of GATT allows regional trading arrangements to be set up as a special exception to the MFN rule if tariffs and other barriers are eliminated for substantially all the trade. There is, however, no agreement on what numerical share of trade constitutes "substantially all."

Table 8 shows impacts on Nepali imports, tariff revenue, and total tax revenue from implementing various tariff and VAT changes in relation to trade in the South Asia region. India accounts for over 63 percent of imports and the six other South Asian countries collectively account for less than 0.5 percent (Table 12). Thus, from the perspective of Nepali imports, free trade in South Asia is equivalent to free trade with India.

Scenario 1 in Table 8 applies tariffs at the agreed preferential rates with no exemption while eliminating the Agricultural Reform Fee, and other charges like fines and demurrage. VAT and excise are not adjusted, and tariffs on countries outside South Asia are not changed. This modest incremental reform appears to be roughly revenue-neutral. In other words, simply applying agreed statutory rates on imports and eliminating tariff exemptions on imports from South Asia can pay for the elimination of the Agricultural Reform Fee currently levied on Indian agricultural imports. This would require no further change to the domestic tax regime.

Scenario 2 simulates complete free trade with South Asia, but tariffs on imports from the rest of the world are unchanged. Further, the existing VAT rate of 13 percent is enforced strongly on all imports and domestically produced goods. This scenario is unfavorable to Nepal as total tax revenue drops from Rs. 60 billion to Rs. 56.4 billion (by more than six percent). This indicates that even the full force of a perfectly implemented VAT at the existing rate is not sufficient to recoup tariff revenue loss of more than 62 percent (from Rs. 15.6 billion to Rs. 5.9 billion) as a consequence of free trade with the rest of South Asia. Scenario 3 shows, however, that a VAT of 15 percent is adequate to make up for the revenue cost of free trade with South Asia. Net tax revenues increase by 4.5 percent.

In scenario 4, I foresee complete free trade within South Asia, enforcement of the VAT at 15 percent, elimination of ARF and other charges, and application of a uniform tariff of eight percent on imports from the rest of the world. This is almost equivalent to scenario 3, except that under this scenario, applied weighted tariff increases from 2.6 percent to 2.8 percent. In other words, scenario 3 is slightly more protectionist, but administratively simpler because there are only two tariff rates to enforce: zero percent for South Asian imports and eight percent for the rest.

Scenario 5 extends SAFTA to include China, envisioning a free trade area around Nepal that is peopled by 2.5 billion consumers. Interestingly, zero tariffs on all Indian and Chinese imports can be compensated by the full application of the VAT at 15 percent. Because China and India accounted for three-quarters of Nepali imports in 2008, reducing all tariffs on them to zero reduces the trade-weighted collected tariff (rate of protection) from seven to under two percent.

1.3.4.4 *Regional Free Trade with Sensitive Lists*

The Sensitive List shields products from tariff cut commitments on the basis of self-defined national interest. Among the members of SAFTA, Nepal maintains the longest list of sensitive products that are exempt from progressive tariff cuts (Table 13). By 2016, only products that are not on the Sensitive List whose tariffs will be confined to between zero and five percent.[35] Of the 1295 products (at the HS 6-digit level) on Nepal's Sensitive List of imports from the larger South Asian economies (India, Pakistan, Sri Lanka), more than 250 were not even imported into the country in 2008. The average tariff level of products on the Sensitive List is higher than those not on the list, as shown in Figure 3. For products on the list, there is a noticeable "bunching" around the rates of 15, 20, 25 and 40 percent,

35 In South Asia, Bhutan has the shortest list, followed by India's list for LDCs. India's list for Pakistan and Sri Lanka is much longer.

whereas for products not on the list, the densities are higher at lower tariff rates of five and 10 percent.

Scenario 1 in Table 9 presents the revenue baseline when there is free trade with South Asia (with tariffs and other taxes, but not excise, eliminated). The existing pattern of VAT is unchanged, as are tariffs on the rest of the world. Predictably, with 63 percent of total imports rendered duty-free, tariff revenues collapse by nearly 62 percent, and overall government revenues are reduced by 22.4 percent. Trade-weighted average applied tariff rate also drops from seven to 2.6 percent. The difference with scenario 2 in Table 6 is that in the latter, tariff cuts are accompanied by full enforcement of the existing VAT rate, leading to an overall revenue decline of only 6.1 percent.

Scenario 2 repeats the previous simulation, but allows no tariff cuts on products on the government's existing Sensitive List. Tariff is not reduced to zero on 1092 products (but other taxes including the ARF are eliminated). This limits revenue loss from imports to only about 10 percent, and when revenue from domestic production is allowed for, the government revenue drops by only 7.9 percent. The existing Sensitive List, therefore, protects revenue by nearly 15 percentage points. The down-side of this is that the trade-weighted average applied tariff rate has only dropped by 0.9 percentage points, from the pre-reform seven percent to the post-reform 6.1 percent. This suggests that while Nepal has signed up for freer trade, it is exhibiting anxiety about the consequences by using a lengthy Sensitive List that is legally sanctioned but operationally detrimental to the ethos of freer trade.

In scenario 3, I devise an *alternative* Sensitive List with 1096 products at the HS 8-digit level (same number as the government's existing list) with the sole objective of minimizing revenue loss from intra-regional free trade. The alternative Sensitive List is prepared by simulating unconditional free trade, and looking at final revenue changes at the product level subsequent to the three channels of

adjustment described in Section 3. Products that recorded the highest losses are sorted and 1096 of them put on the Sensitive List. This preserves revenues by an additional 3.4 percentage points over and above the government's list. Indeed, tariff revenues *increase* under this scenario; it is only after accounting for the loss of other taxes that total revenue falls from Rs. 60 billion to Rs. 57.3 billion. The consequence of applying such a conservative Sensitive List is that there is no meaningful reduction in distortion from trade taxes as a result of intra-regional free trade. The trade-weighted average applied tariff rate stays unchanged at seven percent.

Scenarios 2 and 3 do not lead to as big a revenue loss as under complete intra-regional free trade because the Sensitive Lists are devised by counting the number of tariff lines. This approach is irrespective of the magnitude of the share of individual imports, and all high value tariff lines can be shielded from cuts. Indeed, the government's Sensitive List covers 50 percent of all imports, and my alternative list covers 84 percent of imports. This suggests that if the purpose of a regional free trade agreement is to foster regional trade, either the Sensitive Lists ought to be scrapped, or capped by value, in line with Article XXIV of GATT that permits an exception to the WTO's sacrosanct MFN principle (GATT Article I) only if regional trade blocs cover substantially all the trade among members.

Next, I examine the revenue consequences of free trade with South Asia when Nepal is permitted to design a Sensitive List that cumulatively accounts for 5, 10, and 20 percent of trade value. In other words, "substantially all the trade" is interpreted as 95, 90, and 80 percent of total imports, respectively.

Scenario 4 caps the cumulative import value of products in the Sensitive List at 20 percent. This list was created by adding the share of revenue changes normalized by the import value of each product from the South Asia region. Although this list is longer, in terms of the number of tariff lines shielded, than in the preceding two scenarios, capping the value at 20 percent frees up many high-value import categories that are now subject to tariff cuts. Overall revenue in this case decreases by 10.4 percent. Scenario 5 caps import value at 10 percent, leading to overall rev-

enue loss of 13.8 percent. Scenario 6 caps the Sensitive List at five percent of import value, leading to a loss in revenue of 18.1 percent (Rs. 11 billion), which is more than under complete intra-regional free trade (scenario 1). In these simulations, the weighted average rate of collected tariffs halve, from 7 to 3.5 percent.

The simulation results reported in Table 9 illustrate that the design of Sensitive Lists is crucial, with potential for either fostering or frustrating the objective of regional free trade. Sensitive Lists that are carved out by counting tariff lines appear to undermine the objective of intra-regional free trade more than when such lists shield products by value. In all cases, revenue losses are big, but as shown in Table 8, these can be recouped through reforms to the domestic tax regime, especially a full and effective implementation of the VAT at existing or slightly higher rates.

1.3.5 *Robustness*

In this section, two major simulations from Tables 6 and 8 are re-run allowing for higher elasticities. Scenario 1 of Table 10 uses default elasticities and is identical to scenario 1 of Table 6 where the reform consists of a 50 percent cut in statutory tariffs on all imports from all countries matched by an effective 13 percent VAT on all goods. Scenario 2 repeats this simulation with higher elasticities: three for export substitution and two for domestic substitution, with demand elasticity applied at the *disaggregated product level* using the estimates of Kee et al. (2008). Scenario 3 repeats scenario 2, with an additional increase in only the exporter substitutability parameter from three to six.

The results in scenarios 2 and 3, compared to scenario 1, confirm that the responsiveness of imports to relative price changes is increasing in substitutability. Compared to the default case, imports increase by two percentage points, which reduces the loss in tariff revenue by 5.8 percentage points. Overall tax revenue increases by 3.3 percentage points when elasticities increase.

Scenarios 4 to 6 simulate the revenue consequences – under varying sets of elasticities – for free trade under SAFTA with a Sensitive List that I create to cap imports under exemption to not exceed 10 percent of total import value from South Asia. This reform is closer to the spirit of freer regional trade, but it leads to greater revenue losses. Consistent with the previous set of simulations, revenue losses are decreasing in elasticity: the higher the degree of substitution allowed in response to import and domestic prices, the smaller the decline in revenue.

Note a nuanced change between scenarios 2 and 3 versus scenarios 5 and 6 in Table 10. The difference between scenarios 2 and 3 and between 5 and 6 lies only in the exporter substitution elasticity. In the case of coordinated tax and tariff reform, *all* tariffs are cut and domestic tax is enforced on *all* goods. If there was no exemption on any good, this reform would not have triggered any substitution among exporters. Any increase in imports would be a result of final domestic price changes leading to increased demand for all products irrespective of origin. Because the existing VAT is not applied uniformly, the reform does lead to relative price changes, permitting some substitutability in imports by destination. The overall effect is that higher *exporter* substitutability (everything else being equal) leads to greater import response, tariff revenue, and total tax collection.

In scenarios 4, 5, and 6, however, the reform entails a radical cut in tariffs on South Asian imports only. When all elasticities increase in tandem, the net loss of revenue is less than under the default case. This is consistent with previous simulations where higher elasticities led to greater substitutability and import demand in response to overall price fall. However, when I increase *only* the exporter substitutability elasticity in scenario 6, overall tariff and tax revenues decrease by more than in scenario 5. The reason for this is that as a result of tariff elimination within South Asia, there is substitution of imports away from the rest of the world. But there is no tariff earned on South Asian imports under free trade. Because tariffs are part of the VAT base, elimination of tariffs leads to a further fall in revenue from VAT.

1.4 RELATED ISSUES IN TARIFF REFORM

1.4.1 *Change in Domestic Prices and Production*

Together with the revenue consequences, TRIST simulations indicate the extent to which domestic production is substituted for by imports when the latter become cheaper as a result of tariff cuts. Products are clustered by sector at the International Standard Industrial Classification (ISIC) 3-digit level. In my data set, domestic production figures are only available for broadly-defined manufacturing industries. Because inter-sectoral cross-linkages are not incorporated in this model, the projected change in average prices and production apply to each sector only.

Table 11 shows the value of domestic sales before and after Nepal applies zero tariff on all imports from South Asia without and with exemptions (as in scenarios 1 and 2 of Table 9). Predictably, the transport and motor vehicle sectors undergo the biggest change as a result of reforms because these products attract some of the highest rates of tariff at present. Note that because high rates of excise duty and VAT are still applied on some of these products, average prices do not fall dramatically. For example, the rate of protection of the motor vehicle sector falls by 16 percentage points, but still remains at over 12 percent, unlike several other sectors where the rate of protection falls below three percent.

Table 11 disaggregates tariff revenue at the sectoral level. Among the top 10 sectors listed, the loss of tariff revenue is least pronounced in apparel and animal rearing sectors (ISIC 12 and 181). In the remaining sectors, tariff revenues fall by between 46 and 99 percent. If the government's highly liberal Sensitive List shields some of the products which are anticipated to experience big revenue changes (for example, motor vehicles), the picture of domestic price and production change would alter. This is shown in the bottom half of the same table. Transport equipment and motor vehicles are protected from tariff cuts in the government's existing Sensitive List, so modest changes in domestic sales occur in primary sectors (ani-

mal rearing, mining, forestry) and basic manufacturing industries. Change in the level of protection as well as tariff revenues is also less severe than in the case when no product is shielded from tariff cuts.

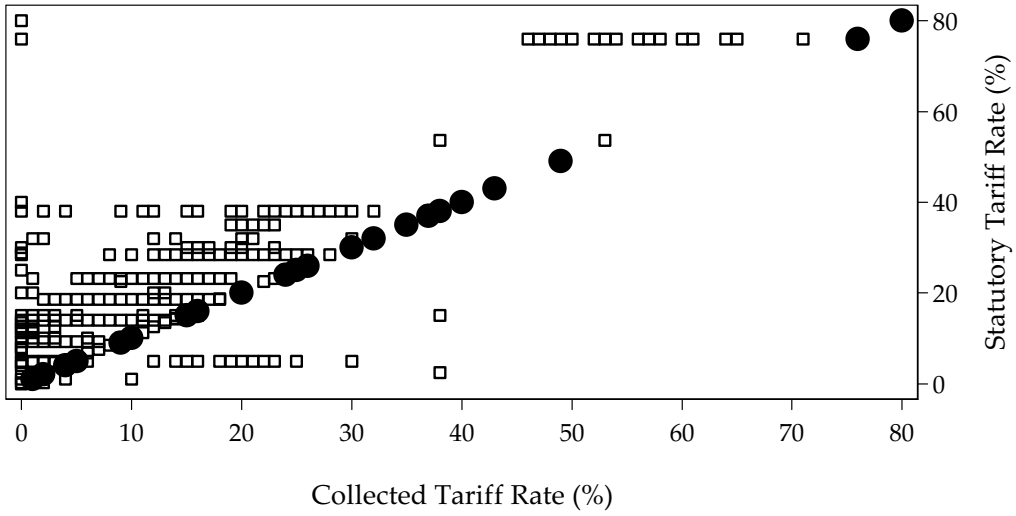
1.4.2 *Collected and Statutory Rates*

Pritchett & Sethi (1994) found for some developing countries[36] that collected (applied) tariff rates are only weakly correlated with statutory rates and that the former decrease non-linearly as the latter rise. This reflects the problem of granting tariff exemptions discretionarily, and opening up opportunities for graft. Revisiting Nepal's import data for 2008, I find that the issue of a discrepancy between statutory and collected tariff rates is less important for Nepal. This is perhaps the effect of the sustained tariff reforms over the past 20 years that have focused on lowering the average rates as well as reducing the number of tariff bands through policy reforms supported by international organizations like the World Bank, IMF, and the World Trade Organization (WTO).

Table 14 lists the mean rate of collected tariff and its dispersion at selected statutory rates. However, except at the highest rate of 80 percent, applied tariff rates are only marginally less than statutory rates, indicating a high degree of compliance on average. When individual import transactions are parsed, however, the degree of discrepancy appears wider. Figure 4 depicts this graphically where 23 percent of import transactions (out of 256,971) paid tariffs that did not match the statutory tariff rate. If the collected tariff rate is less than the statutory rate, it could mean either of the following: i) tariffs were legally sacrificed as part of a conscious government decision, such as import duty rebates as part of an export promotion strategy, ii) other para-tariffs have been introduced in lieu of, or on top of, tariffs, such as the Agricultural Reform Fee, or iii) there is malpractice in the customs administration where authorities exercise improper discretion and exempt certain

36 Their data are for Jamaica (1991), Kenya (1987) and Pakistan (1991).

Figure 4: Statutory and Collected Tariff Rates



Source: Department of Customs, Nepal
Note 1: Number of total observations is 256971
Note 2: 58421 observations where statutory rate > collected rate
Note 3: 36 observations where statutory rate < collected rate

imports from tariffs and taxes. In a negligible number of cases, collected tariff rates are actually *higher* than the ad valorem statutory rates.[37]

If all importers paid the statutory rate, it would be a perfect predictor of the collected tariff rate in a simple regression of applied tariff on statutory tariff. In Nepal, the explanatory power (R^2) of the latter on the former is higher (0.82) than that found by Pritchett & Sethi (1994). Further, a spline regression that allows for different slopes for two subsets of tariff rates (below and above 25 percent), and a quadratic regression of applied rate on statutory rate and its squared value demonstrate a high explanatory power, confirming that the correlation between statutory and collected tariff rates for Nepal is strong, but collected tariff rates do *decline* as statutory rates rise.

37 This could be a result of specific decrees, or that these imports could be akin to personal effects that are generally charged a high tariff but no VAT. In 2008, there were 36 such items, 30 of which belonged to HS 3706 (Cinematography film). Note also that records corresponding to the high statutory rate of 80 percent applying largely to motor vehicles show that a number of exemptions were granted to parties that were neither government nor diplomatic establishments.

Related to this is the issue of smuggling and under-invoicing. If statutory tariff rates and other border taxes are higher than the cost of smuggling, they provide incentives for smugglers to evade high tariffs. Since smuggling is not costless (it takes resources to arrange for successful smuggling, and face the law if caught), lowering of ad valorem tariffs decreases the incentives for smuggling.

Importers also have an incentive to collude with exporters to under-invoice their import value in order to pay less tariffs when duties are ad valorem. An intuitive solution for this is to levy specific tariffs, and not ad valorem, but specific tariffs have their own complications. The more important point is that both the problem of under-invoicing and smuggling are partly triggered by a cascading tariff structure where final goods attract high tariffs and intermediate goods attract low tariffs. Lowering of all tariffs could therefore encourage more goods to flow through formal channels, increasing tariff revenue.

1.5 CONCLUSION

Tariffs have historically served the dual purpose of raising government revenue and protecting domestic producers. This was clearly seen in many developing countries when they experimented with import substitution policies behind high tariff walls in the post-war period.[38] In recent decades, the economic paradigm has shifted decisively towards greater liberalization, diminishing the protective function of tariffs. In the poorest countries, however, the revenue-raising role of tariffs remains important. The short-term concern over loss of revenue, therefore, has often stymied necessary trade and fiscal reforms.

38 In the 19th century, tariffs were a major issue in the rich countries of the day as well. With no income taxes, and the popularly known Export Clause of the Constitution banning the levying of export duty, the United States relied heavily on tariffs. From South Carolina's Ordinance of Nullification (of tariffs) in 1832 that triggered a crisis over federal authority under President Jackson to the Great Tariff Debate of 1888, tariffs were a divisive political issue (Irwin 1997). In Britain, the repealing of tariffs on imported grain (Corn Laws) in 1846 by Prime Minister Robert Peel split the Tory Party and began a brief era of freer trade.

An ideal tax system raises revenue to fund socially sanctioned government expenditures in ways that are administratively and politically feasible while promoting equity and efficiency (Burgess & Stern 1993). As countries become richer, they move towards this ideal by relying more on direct sources of taxation on personal income. Because of capacity constraints and high enforcement costs, however, developing countries focus on narrow tax bases that not only distort incentives and resource allocation, but also raise revenue that is inadequate to fund development needs.[39]

This paper contributes to the debate on ways to reform trade practices without adversely affecting the fiscal base of poor countries. Cross-country evidence from 35 low-income countries also shows that as countries move away from trade-based taxes, they manage to partially offset trade-based revenue losses with domestic sources of taxes. That the presence of VAT is not more strongly associated with revenue recovery is a surprise because this is not what the simulations suggest. This can only be resolved if we acknowledge the great heterogeneity in VAT regimes across countries, with efficacy dependent on factors beyond the ad valorem rate, such as the size of the informal sector, product coverage of the value-added tax, systems of tax refund, and the capacity of tax administrations.

Using actual data on import value, tariffs, and up to ten domestic taxes on more than 400,000 import transactions from Nepal, I develop scenarios in which tariffs can be cut with the least impact on total revenue. This requires eliminating widespread exemptions and an effective implementation of domestic taxes such as VAT and excise spanning a widened base. The degree of informality and the hard-to-tax sectors complicate tax replacement, but a measured approach to reducing tariffs and expanding consumption taxes could minimize adjustment costs. In the

39 Consider a hypothetical scenario where a typical poor country raises taxes of around 12 percent of GDP. It raises another 3 percent of GDP in non-tax revenue. Add to it a fiscal deficit of 5 percent of GDP. It then has to meet its immense development challenges like poverty alleviation with a resource envelope of around 20 percent of GDP. (Note that the interest burden on annual borrowing alone, at 8 percent, would add 0.4 percent of GDP in subsequent years.)

case of regional free trade, Sensitive Lists can be crafted judiciously to minimize the strain on revenue.

The overarching policy lesson is that in countries undertaking trade reform, it is necessary to identify alternative sources of revenue ex ante. This steers developing countries towards strengthening their domestic tax system rather than resisting reforms. The use of partial (or general) equilibrium models, under sensible assumptions, produces estimates that assuage fears about the scale of loss of revenue and production. The models contribute to evidence-based policy making on the parameters of reform such as tariff-cutting formulae, schedules of products to exempt, and sectors to help temporarily. This is a period unprecedented in world history when countries *at all income levels* are engaged in simultaneous trade negotiations at the multilateral, regional, and bilateral levels. The utility of swift, time-sensitive analyses of trade adjustment costs, as attempted in this paper, could therefore be high.

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APPENDIX

1.A HOW THE MODEL IN TRIST WORKS

This illustration simplifies Brenton et al. (2011) to a case where there are only three exporting countries (a, b, c), one exportable product (j), and an importing home country (h). (The real world simulations in this paper involved 133 exporting economies and 4032 products.) Existing imports from each country are multiplied by the price change (Δp_{ij}) from equation 1.15, and adjusted by the elasticity of substitution (σ^{ES}) between imports. Total imports $\sum_n q_{ij} = (q_{aj} + q_{bj} + q_{cj})$ are held constant to isolate the substitution effect. Total import from each country after price change and substitution is:

$$q_{ij}^{ES} = (1 + \sigma^{ES}\Delta p_{ij}) * q_{ij} . \frac{\sum_n q_{ij}}{\sum_n (1 + \sigma^{ES}\Delta p_{ij}) * q_{ij}} \tag{1.17}$$

Second, price change in imports relative to domestic price affects the allocation of expenditure between imports and domestically produced goods. As a result of the reform, the change in the weighted average price of imports ($\triangle P_j$) is the change in each price multiplied by that import's share of total imports:

$$\triangle P_j = \sum_n \left[\frac{q_{ij}}{\sum_n q_{ij}} * \Delta p_{ij} \right] \tag{1.18}$$

Total consumption (Q^D) at home consists of imports from the three countries and domestic production. So, $Q^D = q_{hj} + \sum_n q_{ij}$. Given that the elasticity of substitution between imports and domestic good is σ^{DS}, the import of each good after domestic substitution is:

$$q_{ij}^{DS} = (1 + \sigma^{DS}\triangle P_j) * q_{ij}^{ES} . \frac{Q^D}{\sum_n (1 + \sigma^{DS}\triangle P_j) * q_{ij}^{ES}} \tag{1.19}$$

Third, the weighted average price of imports is adjusted by the share of imports in total consumption. Because the price of domestically produced import-competing product has not altered, the average change in the domestic price of good j is deflated by the share of imports in total domestic consumption. If there is no domestic production, the whole change in price as a result of tariff cut is passed on to domestic consumers.

$$\triangle \widetilde{P_j} \quad = \quad \sum_n \left[\frac{\sum_n q_{ij}}{Q^D} \triangle P_j \right] \tag{1.20}$$

In response to domestic price change $(\triangle \widetilde{P_j})$, consumers now allocate their budget to imports *and* home products. Given the price elasticity of demand (σ^P), total demand $(Q^{D'})$ for good j supplied by each of the three exporting nations and domestic producers is:

$$Q^{D'} \quad = \quad (1 + \sigma^P \triangle \widetilde{P_j}) * q_{ij}^{DS} \tag{1.21}$$

These steps are shown numerically in Table 2 with a hypothetical example, as follows.

A product is imported from Countries A and B valued at 100 and 200 units, respectively. The importing country levies a tariff of 30 percent, VAT of 10 percent, and an excise duty of 5 percent (not shown). Suppose, as a result of a free trade agreement with Country B, the tariff on imports from that country is dropped to zero percent. The ratio of old domestic to world price for the same product from Country B drops from 1.50 to 1.16. The import from Country A sees no change in price because neither its tariff nor domestic taxes have altered. Because the price of the good from Country B has dropped by 23.1 percent, imports from that country rise. By how much depends on the exporter substitutability elasticity. At the default value of 1.5, imports from Country B rise from 200 to 218.8, and those from Country A fall from 100 to 81.3, keeping the pre-reform import volume intact.

Because Country B's share in the home country's import of the product is two-thirds, the weighted drop in the import price is 15.4 percent. Now, there is substitution away from domestically produced goods towards imports from Country B *as well as* Country A. The exact magnitude of this shift depends, again, on the elasticity of domestic substitution. At the default value of 1, the value of imports from Country B rises to 228.9 and from Country A rises to 85 whereas home production falls from 150 to 136.

Finally, because domestically produced goods meet only one-third of total consumption needs at home, the weighted average domestic price of the good falls by 10.3 percent as a result of the 23.1 percent drop in the price of the import from a country that contributes to 45 percent of demand at home. In response, at the assumed price elasticity of 0.5, demand for imports from all three suppliers increases, from 228.9 to 240.7 in Country B, from 85 to 89.4 in Country A, and from 136 to 143 at home. After the reform, total consumption increases from 450 to 473.1. Among the suppliers, Country B (on whose product tariff was cut) benefits the most.

Table 2: Illustration of Price and Demand Response in TRIST

	Import from Country A	Import from Country B	Domestic Production
Price change			
Initial tariff (%)	**30**	**30**	
New tariff (%)	**30**	**0**	
VAT (%)	**10**	**10**	
Initial domestic to world price ratio	1.50	1.50	
New domestic to world price ratio	1.50	1.16	
Change in import price (%)	0.0	-23.1	
Import response in three steps			
1. Exporter substitution			
Initial product value	**100**	**200**	
Price change (%)	0.0	-23.1	
Intermediate step	100.0	269.2	
Value after exporter substitution	81.3	218.8	
2. Domestic substitution			
New product value	81.3	218.8	**150**
Price change (%)	0.0	-23.1	.
Average domestic price change of imports	-15.4	-15.4	*0*
Intermediate step	93.8	252.4	*150.0*
Value after domestic substitution	85.0	228.9	*136.0*
3. Demand			
Latest product value	85.0	228.9	*136.0*
Average domestic price change of imports (%)	-15.4	-15.4	.
Average domestic price change (%)	-10.3	-10.3	*-10.3*
Final demand at home	**89.4**	**240.7**	**143.0**

1.B ADDITIONAL TABLES

Table 3: Tariff Rates and Import-based Revenue in Nepal, 2008

	Statutory tariff	Collected tariff	Excise duty	Value-added tax	Other taxes
Revenue (billions of Rupees)	**18.5**	**15.6**	**3.0**	**23.9**	**2.9**
Share of total tax revenue (%)		34.28	6.58	52.73	6.41
Simple average of tariff/tax rates (%)	11.42	10.54	0.58	11.03	1.89
Weighted average of tariff/tax rates (%)	8.33	7.00	1.26	9.94	1.31

Source: Unpublished data from the Department of Customs, Nepal

Table 4: VAT Collected on Imports, 2005-2010

	2005-06	2006-07	2007-08	2008-09	2009-10
Revenue from VAT (billions of Rupees)	**21.61**	**26.10**	**29.82**	**39.70**	**54.92**
Collected on imports	*13.46*	*16.46*	*19.01*	*25.78*	*34.54*
Collected on domestic consumption	*8.15*	*9.63*	*10.81*	*13.92*	*20.38*
VAT Revenue from imports (%)	62.29	63.09	63.75	64.94	62.89

Source: Government of Nepal (2010)

Table 5: Tariff Revenue by Band, 2008

		Non-SAFTA			
Band (%)	Observations	Import Value	Share (%)	Collected Tariff (%)	Statutory Tariff (%)
a. Zero	1397	16.2	7.3	0.1	0.1
b. 0 to 5	3795	34.0	15.3	6.5	5.6
c. 5 to 15	4990	21.2	9.5	15.7	13.8
d. 15 to 30	1689	5.8	2.6	8.2	7.1
e. 30 to 80	447	1.9	0.9	7.2	6.5
f. Specific (AVE)	162	1.2	0.6	0.9	1.3
		SAFTA			
a. Zero	609	15.8	7.1	0.0	0.0
b. 0 to 5	3491	45.9	20.7	10.9	9.5
c. 5 to 15	5690	25.2	11.3	9.7	14.1
d. 15 to 30	1424	7.5	3.4	6.1	9.5
e. 30 to 80	376	6.2	2.8	13.0	15.1
f. Specific (AVE)	259	41.3	18.6	21.7	17.5
Total	24329	222.1	100.0	100.0	100.0

Note: Import (in billions of Rupees) from 133 partners across 4032 tariff lines.

Table 6: Impact on Revenue of Tariff and Tax Reforms

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Reforms	*Tariff cut 50% Full VAT 13%*	*Uniform tariff 5% Full VAT 13%*	*Uniform tariff 5% Full VAT 15%*	*Uniform tariff 5% Full VAT 17%*	*No tariff Full VAT 17%*
Impact on Imports					
Imports pre	222.1	222.1	222.1	222.1	222.1
Imports post	222.8	221.3	219.0	216.7	223.1
% change in imports	0.3%	-0.4%	-1.4%	-2.5%	0.4%
Impact on Revenue					
Tariff revenue pre	15.6	15.6	15.6	15.6	15.6
Tariff revenue post	9.6	11.1	10.9	10.8	0.0
% change in tariff revenue	-38.3%	-28.9%	-29.6%	-30.4%	-100.0%
Total Tax Revenues on Imports					
Total revenue pre	45.4	45.4	45.4	45.4	45.4
Total revenue post	43.0	44.1	48.3	52.4	40.8
% change in total revenue	-5.2%	-2.7%	6.5%	15.6%	-10.1%
Total Tax Revenues on Imports and Domestic Production					
Total tax revenue pre	60.0	60.0	60.0	60.0	60.0
Total tax revenue post	60.6	61.6	68.0	74.2	62.4
% change in total tax revenue	1.0%	2.7%	13.3%	23.7%	4.0%
Collected Tariff Rate					
Collected applied tariff rate pre	7.0%	7.0%	7.0%	7.0%	7.0%
Collected applied tariff rate post	4.3%	5.0%	5.0%	5.0%	0.0%

Note: All values in billions of Rupees

Table 7: Impact on Revenue of Tariff and Tax Reforms with an Informal Sector

	Scenario 6	Scenario 7	Scenario 8	Scenario 9	Scenario 10
Reforms	*Tariff cut 50%* *Full VAT 13%*	*Uniform tariff 5%* *Full VAT 13%*	*Uniform tariff 5%* *Full VAT 15%*	*Uniform tariff 5%* *Full VAT 17%*	*No tariff* *Full VAT 17%*
Impact on Imports					
Imports pre	222.1	222.1	222.1	222.1	222.1
Imports post	222.8	221.3	219.1	216.8	223.1
% change in imports	0.3%	-0.4%	-1.4%	-2.4%	0.4%
Impact on Revenue					
Tariff revenue pre	15.6	15.6	15.6	15.6	15.6
Tariff revenue post	9.6	11.1	11.0	10.8	0.0
% change in tariff revenue	-38.3%	-28.9%	-29.6%	-30.3%	-100.0%
Total Tax Revenues on Imports					
Total revenue pre	45.4	45.4	45.4	45.4	45.4
Total revenue post	43.0	44.1	48.4	52.5	40.8
% change in total revenue	-5.2%	-2.7%	6.6%	15.6%	-10.2%
Total Tax Revenues on Imports and Domestic Production					
Total tax revenue pre	55.6	55.6	55.6	55.6	55.6
Total tax revenue post	55.3	56.4	62.1	67.7	55.9
% change in total tax revenue	-0.6%	1.4%	11.7%	21.8%	0.5%
Collected Tariff Rate					
Collected applied tariff rate pre	7.0%	7.0%	7.0%	7.0%	7.0%
Collected applied tariff rate post	4.3%	5.0%	5.0%	5.0%	0.0%

Note: All values in billions of Rupees

Table 8: Impact on Revenue of Regional Free Trade

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Reforms	*Stat. tariff* *No ARF* *Existing VAT*	*Zero tariff* *No ARF* *Full VAT 13%*	*Zero tariff* *No ARF* *Full VAT 15%*	*Zero tariff* *Uniform 8% on ROW* *Full VAT 15%*	*SAFTA and China zero tariff* *Uniform 8% on ROW* *Full VAT 15%*
Impact on Imports					
Imports pre	222.1	222.1	222.1	222.1	222.1
Imports post	222.4	224.5	222.3	221.6	222.7
% change in imports	0.1%	1.1%	0.1%	-0.2%	0.2%
Impact on Revenue					
Tariff revenue pre	15.6	15.6	15.6	15.6	15.6
Tariff revenue post	18.0	5.9	5.8	6.1	4.3
% change in tariff revenue	15.7%	-62.1%	-62.5%	-60.5%	-72.3%
Total Tax Revenues on Imports					
Total revenue pre	45.4	45.4	45.4	45.4	45.4
Total revenue post	45.3	38.9	43.1	43.2	41.2
% change in total revenue	-0.1%	-14.3%	-5.0%	-4.8%	-9.2%
Total Tax Revenues on Imports and Domestic Production					
Total tax revenue pre	60.0	60.0	60.0	60.0	60.0
Total tax revenue post	60.1	56.4	62.7	62.8	60.8
% change in total tax revenue	0.2%	-6.1%	4.5%	4.6%	1.3%
Collected Tariff Rate					
Collected applied tariff rate pre	7.0%	7.0%	7.0%	7.0%	7.0%
Collected applied tariff rate post	8.1%	2.6%	2.6%	2.8%	1.9%

Note: All values in billions of Rupees

Table 9: Impact on Revenue of Regional Free Trade with Sensitive Lists

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Reforms	*No SL* *Existing VAT* *No ARF*	*Existing Govt. SL* *Existing VAT* *No ARF*	*Alternative SL* *Existing VAT* *No ARF*	*20% shielded in SL* *Existing VAT* *No ARF*	*10% shielded in SL* *Existing VAT* *No ARF*	*5% shielded in SL* *Existing VAT* *No ARF*
Impact on Imports						
Imports pre	222.1	222.1	222.1	222.1	222.1	222.1
Imports post	228.5	224.9	223.9	225.7	226.7	227.8
% change in imports	2.9%	1.2%	0.8%	1.6%	2.1%	2.5%
Impact on Revenue						
Tariff revenue pre	15.6	15.6	15.6	15.6	15.6	15.6
Tariff revenue post	5.9	13.6	15.6	12.2	10.4	8.0
% change in tariff revenue	-61.9%	-12.4%	0.2%	-21.6%	-33.4%	-48.8%
Total Tax Revenues on Imports						
Total revenue pre	45.4	45.4	45.4	45.4	45.4	45.4
Total revenue post	32.1	40.6	42.7	39.2	37.2	34.6
% change in total revenue	-29.4%	-10.4%	-5.9%	-13.7%	-18.0%	-23.7%
Total Tax Revenues on Imports and Domestic Production						
Total tax revenue pre	60.0	60.0	60.0	60.0	60.0	60.0
Total tax revenue post	46.6	55.2	57.3	53.7	51.7	49.1
% change in total tax revenue	-22.4%	-7.9%	-4.5%	-10.4%	-13.8%	-18.1%
Collected Tariff Rate						
Collected applied tariff rate pre	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
Collected applied tariff rate post	2.6%	6.1%	7.0%	5.4%	4.6%	3.5%

Note: All values in billions of Rupees

Table 10: Robustness Tests with Higher Elasticities

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
	COORDINATED TARIFF AND TAX REFORM			SAFTA WITH SENSITIVE LIST (10% VALUE)		
Parameters						
Exporter and Dom. Elasticity	*1.5 and 1*	*3 and 2*	*6 and 2*	*1.5 and 1*	*3 and 2*	*6 and 2*
Demand Elasticity	*0.5*	*Kee et al. (2008)*	*Kee et al. (2008)*	*0.5*	*Kee et al. (2008)*	*Kee et al. (2008)*
Tariff cut	*50% on all*	*50% on all*	*50% on all*	*SAFTA duty-free*	*SAFTA duty-free*	*SAFTA duty-free*
VAT	*13% on all*	*13% on all*	*13% on all*	*Existing VAT*	*Existing VAT*	*Existing VAT*
Impact on Imports						
Imports pre	222.1	222.1	222.1	222.1	222.1	222.1
Imports post	222.8	227.0	227.2	226.7	239.4	239.5
% change in imports	0.3%	2.2%	2.3%	2.1%	7.8%	7.8%
Impact on Revenue						
Tariff revenue pre	15.6	15.6	15.6	15.6	15.6	15.6
Tariff revenue post	9.6	10.4	10.5	10.4	10.5	10.4
% change in tariff revenue	-38.3%	-32.9%	-32.5%	-33.4%	-32.4%	-33.2%
Total Tax Revenues on Imports						
Total revenue pre	45.4	45.4	45.4	45.4	45.4	45.4
Total revenue post	43.0	44.8	45.0	37.2	38.9	38.7
% change in total revenue	-5.2%	-1.2%	-0.9%	-18.0%	-14.4%	-14.7%
Total Tax Revenues on Imports and Domestic Production						
Total tax revenue pre	60.0	60.0	60.0	60.0	60.0	60.0
Total tax revenue post	60.6	62.6	62.8	51.7	53.6	53.4
% change in total tax revenue	1.0%	4.4%	4.6%	-13.8%	-10.8%	-11.0%
Collected Tariff Rate						
Collected applied tariff rate pre	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
Collected applied tariff rate post	4.3%	4.6%	4.6%	4.6%	4.4%	4.3%

Note: All values in billions of Rupees

Table 11: Change in Price, Production, Revenue, and Protection

		PRICE	DOMESTIC PRODUCTION		TARIFF REVENUE		PROTECTION	
ISIC	Description	*Change*	*Pre*	*Post*	*Pre*	*Post*	*Pre*	*Post*
With No Sensitive List								
359	Transport equipment n.e.c.	-19.73%	34,153,000	31,399,433	994,567,806	38,676,005	24.20%	0.90%
341	Motor vehicles	-12.99%	41,464,000	39,204,213	2,138,244,335	918,667,069	28.30%	12.20%
141	Quarrying of stone, sand and clay	-12.43%	47,421,000	45,091,897	82,464,005	2,583,235	13.90%	0.40%
142	Mining and quarrying n.e.c.	-17.51%	339,020,000	323,626,886	184,379,204	113,653	28.00%	0.00%
261	Glass and glass products	-8.99%	20,586,000	19,774,849	124,328,389	30,655,939	11.50%	2.80%
12	Farming of animals	-7.53%	18,700,000	18,093,203	397,635	328,896	0.20%	0.10%
20	Forestry, logging	-6.61%	140,000	135,715	4,321,501	1,612,831	7.30%	2.70%
269	Non-metallic mineral products	-14.66%	10,995,294,000	10,704,445,219	1,144,878,146	59,877,975	17.90%	0.90%
343	Parts and accessories for vehicles	-5.52%	30,000,000	29,246,069	53,985,555	24,714,072	7.50%	3.40%
222	Printing	-5.91%	18,826,000	18,394,321	12,190,961	6,569,016	11.00%	5.90%
With Sensitive List								
142	Mining and quarrying n.e.c.	-17.51%	339020000	323626886	184379204	113653	28.00%	0.00%
261	Glass and glass products	-8.26%	20586000	19841379	124328389	40587944	11.50%	3.80%
12	Farming of animals	-7.53%	18700000	18093203	397635	328896	0.20%	0.10%
20	Forestry	-6.61%	140000	135715	4321501	1612831	7.30%	2.70%
291	General purpose machinery	-3.80%	176639000	173603095	191972406	116474391	6.20%	3.70%
342	Vehicle bodies, trailers	-5.91%	13745000	13516473	2320123	1380290	12.00%	7.20%
315	Electric lamps and lighting equipment	-3.17%	41907000	41314225	51980453	43377661	9.80%	8.20%
271	Basic iron and steel	-3.63%	6414842000	6325053323	957951571	287136311	3.80%	1.10%
312	Electricity distribution apparatus	-2.92%	11228000	11072071	29201055	12864631	3.50%	1.60%
289	Fabricated metal products	-5.21%	1496438000	1475960021	154013435	79458131	8.60%	4.40%

Note: Top 10 sectors sorted by change in domestic production; values in Rupees

Table 14: Statutory and Applied Tariff Rates

Statutory Rate (%)	Mean Tariff (%)	St. Dev.	25th pct	75th pct	Total Obs.
5	4.92	1.37	5	5	53285
10	9.92	0.97	10	10	28254
15	14.88	1.31	15	15	49208
20	19.98	0.56	20	20	26221
30	29.47	3.68	30	30	3320
40	39.68	3.56	40	40	948
80	77.72	13.33	80	80	771

Source: Unpublished data from the Department of Customs, Nepal

Table 12: Major Exporters to Nepal, 2008 & 2010

Partners 2010 (UN COMTRADE)		Partners 2008 (Nepal Customs)	
Economy	Value (US$m)	Economy	Value (US$m)
India	2900.0	India	2064.2
China	536.4	China	365.9
United Arab Emirates	456.8	Indonesia	104.8
Indonesia	110.7	Japan	76.6
Thailand	102.6	Singapore	76.5
United Kingdom	99.8	Thailand	64.7
Japan	85.7	Malaysia	56.7
Korea, Rep.	80.5	Argentina	51.0
United States	73.7	United States	46.4
Argentina	68.9	Germany	34.9
Singapore	68.5	Saudi Arabia	32.0
Australia	67.7	Korea, Rep.	30.7
Hong Kong, China	57.8	Taiwan, China	22.3
Malaysia	57.5	United Arab Emirates	21.5
Switzerland	37.5	United Kingdom	21.5

Note: Different sources and years used for check of consistency

Table 13: Number of Products in the Sensitive Lists

	In use as of 2010	Agreed reduction	In effect from November 2011
Afghanistan	1072	214	858
Bangladesh	1233*	246*	987*
	1241**	248**	993**
Bhutan	150	0	150
India	480*	96*	384*
	868**	173**	695**
Maldives	681	136	545
Nepal	**1257***	**251***	**1006***
	1295**	**259****	**1036****
Pakistan	1169	233	936
Sri Lanka	1042	208	834

Source: SAARC Secretariat; *For LDCs, ** For Non-LDCs

Table 15: Summary of Data used in Table 1 Regressions

Variables	Obs.	Mean	St. Dev.	Min	Max	Source
Trade tax revenue relative to GDP (%)	933	4.15	4.10	0.04	33.33	IMF IFS
Imports relative to GDP (%)	950	34.00	20.32	0.12	148.58	IMF IFS
Export of natural resources per capita (log)	965	5.21	3.01	-5.15	12.22	World Bank
Oil and gas rent per capita (log)	1000	-2.02	3.24	-3.91	7.31	WDI
Per capita GDP (log)	943	5.78	0.55	4.52	7.25	WDI
Inflation (log)	804	2.21	1.18	-3.91	7.00	IMF IFS
Share of aid in GDP	938	12.48	10.43	0.05	94.92	WDI
Share of agriculture in GDP	906	33.59	12.12	4.21	68.88	WDI
VAT rates	1000	6.27	8.06	0	35	Author

Table 16: List of Countries and Related Tax Data, 2002-2006

Country	Total Tax Rev.	Domestic Tax Rev.	Trade Tax Rev.	VAT rate
Bangladesh	9.1	6.6	2.5	15
Benin	14.1	11.9	2.1	18
Bhutan	10.4	10.0	0.4	.
Burkina Faso	10.5	9.0	1.5	18
Burundi	17.9	15.0	3.0	.
Cameroon	21.1	19.0	2.2	19.3
Central African Republic	8.9	7.3	1.6	18
Chad	7.3	5.2	2.1	18
Comoros	10.3	.	.	.
Congo, Rep.	11.5	9.8	1.7	18.9
Cote d'Ivoire	15.2	10.2	5.0	18
Ethiopia	13.0	10.5	2.5	.
Gambia, The	22.0	.	.	.
Ghana	17.5	13.4	4.1	12.5
Guinea	10.9	9.1	1.8	18
Haiti	8.3	6.1	2.2	10
India	8.8	7.0	1.8	.
Indonesia	11.6	11.0	0.6	10
Kenya	17.9	16.1	1.8	16
Lesotho	35.6	15.3	20.3	.
Madagascar*	9.4	6.2	3.1	18
Malawi	18.4	16.3	2.1	17.5
Mali	14.1	.	.	15
Mozambique	10.7	8.8	1.9	17
Myanmar*	4.4	3.7	0.8	.
Nepal	8.9	6.0	2.9	13
Niger	10.1	5.4	4.7	19
Nigeria	13.1	9.5	3.6	5
Pakistan	11.8	10.3	1.6	15
Papua New Guinea	20.3	18.7	1.6	10
Rwanda	12.1	10.5	1.7	18
Sao Tome and Principe	19.5	14.6	4.9	.
Senegal	16.9	13.8	3.1	18
Sierra Leone	12.0	5.8	6.1	.
Solomon Islands	15.4	9.3	6.1	.
Tanzania	11.7	10.6	1.1	20
Togo	11.5	5.6	5.9	18
Uganda	12.3	11.1	1.2	18
Zambia	17.5	15.3	2.3	17.5
Zimbabwe	16.8	15.2	1.6	.

Source: Tax data from Baunsgaard and Keen (2010);
VAT rates from Krever (2008), Ernst and Young (2008), and Doing Business indicators
Note 1: Revenue figures are relative to GDP (in percent)
Note 2: Average years for starred countries (*) is 1997-2001