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ON UNIFORM IMPORT TARIFFS IN DEVELOPING COUNTRIES

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ABSTRACT

The purpose of this paper is to theoretically assess, from a welfare perspective, the desirability of uniform import tariffs. Since the eruption of the debt crisis, many proposals for structural reforms in the developing countries have contemplated a trade liberalization process that would create a low and uniform tariff structure. In this paper I review the literature on the subject and construct a general equilibrium model to evaluate the consequences of alternative structural adjustment policies. Throughout the analysis it is assumed that labor markets and nontradables markets are subject to some distortions.

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I. Introduction

As a large number of countries embark on programs aimed at liberalizing their external sector, issues related to the actual design of trade policies have become increasingly important. In particular, the multilateral institutions have become more and more concerned with some of the specific characteristics of reformed (more liberalized) trade regimes. Broad issues such as the adequate sequencing of reform and the relationship between trade liberalization and macroeconomic adjustment have, in fact, dominated recent policy discussions (Choksi and Papageorgiou, 1986). However, at a more specific level, one of the most important aspects in designing a new and more liberalized commercial policy refers to the structure of import tariffs. Should tariffs in certain sectors be higher than in others, or should they be uniform? As a matter of practical advice, for example, the World Bank is increasingly recommending a uniform tariff structure (Shalizi and Squire, 1988). Other policy advisers, however, have argued that non-uniform tariffs are preferable, with higher tariffs granted to those sector with more potential for creating employment (Foxley, 1983).

The purpose of this paper is to assess analytically, from a welfare perspective, the desirability of uniform import tariffs. The analysis presented here expands previous work in the subject by considering a multiple distortions economy and by concentrating on wage rate rigidity as the one distortion that cannot be easily relaxed. The model derived in the paper provides a unified framework where the interaction of some important features of the developing countries, that until now had been treated separately, are considered.

The fact that in most countries import tariffs are far from uniform (see Table 1), indicates that this issue is indeed important from a policy

TABLE 1

Average and Dispersion of Protection:

(Effective Rates of Protection)

Country	Year	ERP[a]	STD[b]	Year	ERP[a]	STD[b]
Argentina	1969	95	100	1977	46	47
Brazil	1967	80	46	-	-	-
Chile	1961	346	634	-	-	-
Colombia	1969	88	166	1979	56	27
Costa Rica	1968	23	15	-	-	-
Dominican Republic	-	-	-	1971	118	104
Egypt	1966/67	88	64	-	-	-
El Salvador	1968	44	48	-	-	-
Ghana	1968	404	600	-	-	-
Greece	1961	52	57	-	-	-
Guatemala	1968	32	27	-	-	-
Honduras	1968	59	68	-	-	-
India	1968/69	138	109	-	-	-
Israel	1968	89	67	-	-	-
Ivory Coast	-	-	-	1970/72	72	74
Jordan	-	-	-	1979	56	73
Kenya	1967	105	141	-	-	-
Korea	1968	14	44	-	-	-
Malaysia	1963	32	58	1970	68	66
Mexico	1960	32	24	1970	39	34
Nicaragua	1968	63	66	-	-	-
Pakistan	-	-	-	1970/71	202	122
Philippines	1965	42	130	1974	60	82
Singapore	1967	6	10	-	-	-
South Africa	1963/64	17	20	-	-	-
Spain	1968	53	39	-	-	-
Sri Lanka	-	-	-	1970	123	72
Sudan	-	-	-	1971	246	237
Taiwan	1966	84	62	-	-	-
Tanzania	1966	137	135	-	-	-
Thailand	1969	16	29	-	-	-
Uruguay	1968	411	304	-	-	-

[a]Unweighted average effective rate of protection.

[b]Standard deviation of ERP.

Source: Heitger (1987).

design perspective. Our understanding of the criteria and conditions under which tariff uniformity is indeed optimal should be of help to policymakers and economic advisers for making more informed decisions.

The paper is organized in the following way: Section II contains a brief literature review on the general subject of optimal commercial policies. In Section III a general equilibrium model is derived to analyze, from a welfare perspective, the issue of tariff uniformity. The model considers a small open economy that consumes and produces four goods and that is subject to three types of distortion. In Section IV we use our general model to investigate the circumstances under which a uniform tariff will be optimal (in a second best sense) in a world with only final goods. In Section V we expand our model, allowing for the incorporation of imported intermediate inputs. We then address the uniform tariff question under this new set of assumptions. In Section VI we explicitly include government consumption into the analysis, asking how a trade liberalization reform will affect welfare in an economy where government expenditures must be balanced by tax and tariffs revenues. This type of revenue-neutral reform is highly relevant for a number of poor countries, especially in Africa, that rely heavily on import and export taxes as a source of government revenue. In Section VII we present the concluding remarks and we suggest some extensions to this line of work.

II. Optimal Tariff Structures: A Selective Literature Review

At a textbook level the issue of optimal tariffs and tax structure is trivial and, for policy purposes, mostly uninteresting. In the usual setting the first best solution is to get rid of all distortions simultaneously: laissez-faire is the optimal trade policy. On the other hand, if the government needs to raise some revenues to finance its expenditures, the theoretical answer is again clear. The government should institute a tax-tariff structure based on the Ramsey-Rule principle: after taking into account existing cross effects (both in demand and supply) the rate of taxation in each sector should be inversely proportional to the price elasticities of these functions. However, if we abandon the first best world of textbooks and plunge into the more realistic world of second or third best options, free trade will generally be suboptimal. Indeed this was one of the examples used by Lipsey and Lancaster (1956) in their classical article on the theory of the second best. They considered a world with three goods -- one domestically produced and two imported -- and investigated what was the optimal tariff for one of the importables given that the other one had a positive tariff.

Another important application of the theory of the second best in commercial policies for the developing countries refers to the existence of a labor market distortion that, for political or other reasons, cannot be relaxed. Haberler (1950) was possibly the first one to argue that under these circumstances some form of trade restrictions might be welfare enhancing. However, his analysis was restricted to the case of one importable sector and, thus, did not venture into the issue of tariff uniformity. In two important contributions Richard Brecher (1974a,b) formally expanded the analysis of the standard Heckscher-Ohlin model by introducing economy-wide

minimum wages. In Brecher (1974a) he tried to determine whether the standard trade theorems were affected by the minimum wage assumption. Additionally, Brecher investigated the welfare implications of tariffs, concluding that "when the (home) country lacks ... monopoly power in trade, the optimal home strategy is not necessarily free ... trade" (Brecher, 1974a, p. 111). In Brecher (1974b), on the other hand, he considered the case of a country that had monopoly power in foreign trade and ranked three types of commercial policies under the assumption of an economy-wide minimum wage.[1]

In his contribution to the Handbook of Public Economics Avinash Dixit (1985) develops a multi-goods general equilibrium model to investigate the issues of optimum taxation and tariffs. Dixit shows, in Section 3, that in the presence of externalities in production, free trade is no longer optimal. He also analyzes optimal tax and tariff policies for the case of non-economic objectives and finds that, under most circumstances, his results are consistent with those obtained by Johnson's (1965) classic study.

In another important piece on the subject, Bertrand and Vanek (1971) analyze the optimal commercial policy in a general equilibrium setting with many goods and factors and imported intermediate inputs. They consider the case where many import competing sectors are subject to tariffs and where, for political or other reasons, not all these tariffs can be eliminated. Their main finding (Theorem 4) is that, as long as there is no complementarity, the eliminateion of variable and extreme distortions is welfare improving. As a consequence they claim that it would be optimal to set all tariffs at an intermediate level situated between the highest and lowest

[1] The effects of minimum wages on international trade is also discussed by Lefeber (1971), Jones and Neary (1984), Dixit and Norman (1980) and Edwards (1988).

distortion that cannot be altered. The intuitive interpretation of this result is rather simple: by reducing extreme tariffs, resources (both primary factors and intermediate inputs) are reallocated to those sectors where the difference between consumers' valuation and real production costs is the greatest.

Another participant in the uniform tariff debate has been Arnold Harberger. In a series of papers (1984, 1986, 1989) he has used shadow pricing principles to argue that trade liberalization reforms should generally be aimed at achieving a uniform tariff structure. His suggestions are based not only on welfare considerations, but also on political economy and institutional factors.

Several recent surveys have enriched the literature on the subject. Among these, it is worth mentioning the contribution by Panagariya (1989) where different ways in which the literature has approached the uniform tariff question are presented in an intuitive diagrammatic fashion. An important issue in this debate is related to the optimal tariff structure in cases in which the government needs to collect a given amount of revenue to finance its expenditures. This kind of analysis falls in the general category of Ramsey-Rule type problems. In a recent comprehensive study Chambers (1989) has used this general framework to investigate, employing a large set of alternative assumptions, the conditions under which tariff uniformity will be optimal. He considers the cases of economies with and without nontradable goods, as well as with and without intermediate goods, and finds that uniformity is an uncommon outcome in a Ramsey-Rule type of framework. One of his main results establishes that uniform tariffs will generally not be optimal in the case in which the government needs to raise a certain amount of revenue. Moreover, he argues that even if the stringent

conditions required for uniformity to be optimal are met, it will be difficult for the policymakers to have the information necessary to determine the level at which this optimal tariff should be set.

Another group of authors have investigated the issue of optimality of uniform tariffs across time. The question this subset of the literature has asked is whether there are circumstances under which it is optimal for a country to maintain its tariff structure invariant, i.e., maintain the same tariff "today" and "tomorrow". Edwards and van Wijnbergen (1986) analyzed this issue using an intertemporal model with initial tariffs and borrowing constraints and found that, for a certain set of parameters, the optimal intertemporal tariff structure was not a uniform one. They argued that this result provided support to the idea that a gradual process of trade liberalization is generally superior to an abrupt trade reform.

III. A General Equilibrium Model for Evaluating the Welfare Consequences of Alternative Trade Reform Packages

The purpose of this section is to develop a real general equilibrium model to analyze the welfare consequences of trade liberalization policies.[2] Although the main objective of the model is to focus on the final welfare effects of liberalization reforms, this framework can be easily used to analyze the behavior of other important variables such as interest rates, the trade account, employment and the real exchange rate.[3] The model complements the existing literature on the subject by providing a unified framework that combines a number of features of the developing economies that until now have been treated in isolation. First, the model uses a formal general equilibrium model with multiple distortions; second, the taxation of nontradable goods is explicitly considered as an important source of government revenue; and third, it is assumed that rigid wages are a key distortion in the economy and, thus, we analyze closely the way in which the labor market adjusts to tariff changes. The most important contribution of this model, however, is that it explicitly considers the role played by real exchange rates in determining a small country's optimal tariff structure.

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[2] As explained by Panagariya (1989), a number of possible criteria have been used in the literature to evaluate the desirability of a certain commercial policy. In this paper we concentrate on the traditional view, and investigate the welfare consequences of moving towards tariff uniformity.

[3] The model is partially based on that developed in Edwards (1989b). However, in this paper we develop a very general static framework model while in Edwards (1989b) a more restricted intertemporal model was considered. Also, here we assume that there are two or more final importable sectors, while in previous work, such as the papers by Harberger (1984, 1989) and Chambers (1989), the case of a single importable sector was analyzed.

The model assumes that there are two distortions in the economy in addition to import tariffs: (1) real wage rigidities that generate unemployment,[4] and (2) a tax in the services sector which, in turn, is treated as a composite nontradable good whose market has to clear in every period. In this section we will present the basic benchmark for analyzing the optimality of uniform tariffs; thus, the model used here still has some simplifying assumptions, such as the presence of final goods only, that will be relaxed in the subsequent sections.

III.1 The Model

Assume the case of a small open economy that faces given world prices of tradable goods and world interest rates. The agents of this economy consume and produce four goods -- exportables (X), nontradables (N), and two types of importables (M^A) and (M^B). In order to concentrate on essentials we assume that there is only one period and, thus, we ignore issues related to intertemporal substitutability. There are a large number of producers and (identical) consumers, and perfect competition prevails. The labor market is distorted by a minimum wage $\bar{w}$. In the spirit of international trade theory, it is assumed that the supply of labor, as well as that of the other factors, is inelastic.[5] Besides labor, it is assumed that there are capital and two types of natural resources.

Consumers maximize utility subject to their budget constraint, whereas firms maximize profits subject to existing constant returns to scale

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[4] In the body of the discussion we assume that this labor market distortion takes the form of a minimum wage expressed in terms of the exportable good. Later, however, we briefly discuss the case of nominal wage indexation to a general price index.

[5] See, however, the accompanying paper on structural reforms and labor market adjustment.

technology, availability of factors of production, and the predetermined minimum wage.

The representative consumer problem can be stated as follows:

$$\max U(C_N, C_X, C_{M^A}, C_{M^B}),$$

subject to:

$$C_X + p^A C_{M^A} + p^B C_{M^B} + fC_N \leq \text{Income} \qquad (1)$$

The price of exportables has been taken to be the numeraire. C_X, C_{M^A}, C_{M^B}, C_N are consumption of X, M^A, M^B and N. p^A and p^B are the domestic prices of type A and B importables relative to exportables; and f is the relative price of nontradables faced by consumers.

Income is given by: (1) income from labor services; (2) income from the renting of capital stock and of natural resources that consumers own to domestic firms; and (3) income obtained from government transfers. These correspond, in the basic version of the model, to the government's revenue from tariffs and taxes on nontradables. In Section V, however, we assume that instead of transferring tariffs and tax revenues to the private sector, the government uses those resources to finance its own consumption.

The solution to the consumers optimizing problem is conveniently summarized by the following expenditure function:[6]

$$E = E(1, p^A, p^B, f, U) \qquad (2)$$

On the other hand the producers maximization problem can be summarized with the aid of a restricted revenue function, which give us the maximum revenue that firms can obtain after making all the optimal decisions in

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[6] On expenditure functions and their properties see, for example, Dixit and Norman (1980).

terms of hiring and production given the distortion in the labor market (see Neary 1985). Denoting by R the restricted revenue functions; by q the price of nontradables faced by producers; and by K the vector of other (nonlabor) factors of production, we have that:

$$R = R(1, p^A, p^B, q, L(1, q, p^A, p^B, \bar{w}), K) \tag{3}$$

where L( ) is an employment function.[7] Some useful and well known properties of revenue functions are that their derivatives with respect to goods prices are equal to supply functions, and that their derivatives relative to factor endowments are equal to the marginal product of that factor. In addition, revenue functions are convex.[8] Notice that a simplifying assumption is that there are no intermediate inputs. In Section IV below we relax this assumption, inquiring into the way in which the incorporation of inter-industry trade will affect our final results.

The fact that there is a tax on the nontradables market is captured by the inclusion of different prices of nontradables in the expenditure and revenue functions in equations (2) and (3) (f and q, respectively). The difference between producers and consumers prices is, of course, given by the tax on nontradables τ:

$$f = q + \tau \tag{4}$$

In this stylized model the relative price of nontradables (q and f) can be interpreted as a measure of "the" real exchange rate. As is shown in

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[7] On the property of employment functions see Edwards (1989b).

[8] Moreover, an important property of restricted revenue functions is that they directly incorporate the effect of unemployment on earnings into the budget constraint. Consequently there is no need to deal with issues related to rationing.

Dornbusch (1980) and Edwards (1989a) changes in the tariff structure will result, through both substitution and income channels, in changes in the domestic prices of nontradables or real exchange rate. As is shown below, these relative price changes will play an important role in determining the welfare effects of alternative tariff reforms. As said before, the incorporation of this real exchange rate effect constitutes an important difference between our analysis and that of previous work.[9]

We assume that both types of imports are subject to tariffs t^A and t^B. Consequently, domestic prices of importables are given by:

$$\begin{aligned} p^A &= p^{A*} + t^A \\ p^B &= p^{B*} + t^B \end{aligned} \tag{5}$$

where p^{A*} and p^{B*} are their respective world prices.

The complete model is given by the following set of equations where a subindex refers to a partial derivative:

$$R(1,p^A,p^B,q,L(\ ),K) + T = E(1,p^A,p^B,f,U) \tag{6}$$

$$T = \tau R_q + t^A I^A + t^B I^B \tag{7}$$

$$R_q = E_f \tag{8}$$

$$I^A = (E_{p^A} - R_{p^A}); \quad I^B = (E_{p^B} - R_{p^B}) \tag{9}$$

Equation (6) is the budget constraint, and says that income (the left hand side) has to equal expenditure (the right hand side). T is the value of government transfers to the public and is given by equation (7), where τR_q is the revenue from the tax on nontradables (τ is the tax rate and R_q is the equilibrium quantity produced and consumed). On the other hand,

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[9] Notice, however, that Harberger (1989) also considers real exchange rate adjustments in his diagrammatic analysis of tariff reforms.

$t^A I^A$ and $t^B I^B$ are revenues from import tariffs; t^i is the tariff on imports i $(i = A,B)$, and I^i denotes the quantity imported of each good and is defined in equation (9) as the excess demand for each importable. (Remember that E_{p^i} is the demand for importable i and R_{p^i} is the supply of that importable.) According to equation (6) the government does not use tax and tariff revenues to finance its own consumption. However, this assumption is relaxed in Section V, where we analyze the welfare consequences of tariff reforms in the presence of a binding government budget constraint. Finally, equation (8) states that the nontradables goods market has to clear: R_q is the quantity produced of these goods, while E_f is the quantity demanded.

An important characteristic of this model is that, since we assume that the minimum wage $\bar{w}$ is above the equilibrium level, there is initial unemployment. However, since we are assuming an inelastic supply of labor it will be enough to find out what happens to employment given a shock or policy measure in order to know how the rate of unemployment will evolve. In fact, as will be shown in the following sections, changes in labor market equilibrium will play an important role in determining the welfare consequences of alternative tariff reforms.

III.2 The Welfare Effects of Structural Reform: A General Approach

The model presented above can be used to analyze a number of important welfare questions related with structural reforms and, in particular, with trade liberalization. For example, in principle this model could be used to rank, in terms of welfare, the effects of different combinations of taxes

and other distortions.[10] Moreover, the model can be used to evaluate the welfare consequences of liberalization policies characterized by: (1) deregulation of the service sector; (2) a labor market deregulation, captured by a reduction of the minimum wage $\bar{w}$; and (3) alternative ways of reforming the import tariffs structure (a reduction in one or both tariffs, t^A and t^B).

An equation that captures the different channels through which structural reforms will affect welfare in this economy can be obtained by totally differentiating equation (6) (where, as before, subindexes refer to partial derivatives):

$$\begin{aligned} EUdU = {} & t^A dI^A + t^B dI^B \\ & + \tau R_{qq} dq + \bar{w} dL \\ & + \tau R_{qp^A} dt^A + \tau R_{qp^B} dt^B + \tau R_{qL} dL \end{aligned} \tag{10}$$

Although this is not a reduced form -- many of the right hand side variables are endogenous -- equation (10) is highly useful.[11] The first two terms of the right hand side capture the welfare effects stemming from changes in imports of goods A and B. If as a result of whatever reform we are analyzing either I^A or I^B increase we will have welfare gains. These, in turn, will be proportional to the initial distortions t^A and t^B. The reason for this is that initially, and due to the import tariffs, the country was importing "too little" of both goods. Thus any policy resulting in an increase in imports will move the economy closer to the optimum, increasing the level of

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[10] This, however, would require assuming a specific form of the welfare function and assuming values for the key parameters. These issues are addressed in some detail below.

[11] See the Appendix for the derivation of some of the endogenous terms that appear in equation (10).

welfare. The next term ($\tau R_{qq} dq$) summarizes the welfare consequences of changes in the equilibrium quantities transacted in the nontradable sectors. Naturally, these changes operate through adjustments in the real exchange rate or relative price of nontradables (q). If, for example, a reform raises this price (e.g., $dq > 0$) we will have positive social welfare effects (since by convexity of the revenue function R_{qq} is positive) which will be proportional to the initial distortion in this market. The reason, again, is that initially (that is, before the reform), the equilibrium quantities in the nontradable market are "too low". The next term $\bar{w}dL$ stems from the distortions in the labor market and states that if a reform augments employment (e.g., $dL > 0$) social welfare will increase. The final three terms in equation (12) ($\tau R_{qp_A} dt^A + \tau R_{qp_B} dt^B + \tau R_{qL} dL$) are indirect terms originated from the interaction among the different distortions. Their magnitude, then, will basically depend on the sign of several cross elasticities.

In the sections that follow we use several variants of this benchmark model to analyze the welfare consequences of different trade reform packages, particularly those geared at moving the tariff structure towards uniformity. Naturally, since I^A, I^B, q, and L are endogenous variables, in order to obtain the exact expressions for these welfare changes we will need to solve the complete model.[12] For the purposes of this paper, however, this is not necessary since most of the economics and intuition can be obtained from the analysis of quasi-reduced forms such as equation (10). Moreover, we present in the Appendix a reduced form expression for the real exchange rate effect of a change in tariffs in a somewhat simplified setting.

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[12] For the solution of related intertemporal (that is, two periods) models see Edwards (1989a,b,c).

IV. Uniform Tariffs With Final Goods Only

The purpose of this section is to analyze, within the context of the benchmark model of Section III, the welfare effects of a trade reform program that moves the protective structure towards a uniform and low -- that is lower than the original average -- rate of import tariffs. Thus, consider an economy where the import tariff on good A is lower than that on good B ($t^A < t^B$). Furthermore, assume that the tariff on B exceeds that on A by an amount β.

$$t^B = t^A + \beta \tag{11}$$

A tariff liberalization reform that moves the protective structure towards lower and more uniform tariffs can, thus, be characterized by a reduction in the "surcharge" β. Our question then can be posed in the following way: Is it the case, as is often suggested in policy discussions, that a move towards lower and more uniform tariffs will be beneficial for the country in question? If, on the other hand, this is not generally the case, under what circumstances will a move towards uniformity be welfare-enhancing? More specifically, we will ask whether there are circumstances where the second best solution calls for strictly uniform tariffs ($t^A = t^B$). Notice that since we are not imposing the requirement of raising a given government revenue, our analysis is couched strictly in second best terms. This means that an intervention in the form of tariffs, for example, could be justified if it offsets the negative effects of other pre-existing (and unmovable) distortions.

From the manipulation of our benchmark model we obtain that the change in welfare resulting from a small change in β is given by:

$$E_U \frac{dU}{d\beta} = t^B \frac{dI^B}{d\beta} + t^A \frac{dI^A}{d\beta} + rR_{qq} \frac{dq}{d\beta} + (\bar{w}+rR_{qL}) \frac{dL}{d\beta} + rR_{qp^B} \tag{12}$$

It is easy to see a priori, that it is not possible to sign unequivocally this equation. This is a second best type of result: under our assumptions of multiple distortions we do not generally know whether a move towards lower and more uniform import protection will, in fact increase welfare. The reason for this ambiguity can be seen more clearly from the analysis of the (most plausible) signs of each of the right hand side terms of equation (12):[13] The first term $t^B (dI^B/d\beta)$ is the direct welfare effect of the tariff reform and is negative. This is because a decrease (increase) in the tariff on B -- a lower β -- will result in larger (lower) imports of those goods. Since initially imports of B were "too low", any policy that moves the economy closer to its optimal level of imports will be welfare enhancing. The magnitude of this direct effect is proportional to the initial tariff. The second term $t^A(dI^A/d\beta)$ captures the cross effect of the tariff reform on imports of the other importable good. Under the assumption that both A and B are final goods and that they are substitutes in consumption and compete for the use of productive factors, this second term will be positive. This means that a decrease in the tariff on good B will result in lower imports of good A, and, thus, in lower welfare.

The third term $\tau R_{qq}(dq/d\beta)$ is an indirect real exchange rate effect, and summarizes the way in which changes in the relative price of nontradables generated by changes in the tariff, affect output of nontradables and welfare. Under a set of plausible assumptions, discussed in detail in

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[13] We say more plausible signs since many of these terms cannot be signed unambiguously for the more general setting presented here. However, in most cases it is possible to sign these derivatives after making some assumptions regarding a few key parameters. The discussion that follows is cast in terms of a decrease in β.

Edwards (1989b), a reduction in an import tariff will generate an equilibrium real depreciation or a decrease in q;[14] $(dq/d\beta)$ will, then, be positive. Since by convexity of the revenue function R_{qq} is positive, our "real exchange rate" term $\tau R_{qq}(dq/d\beta)$ will also be positive. The intuition is as follows: since the lower β will generate a decrease in q there will be a contraction of the production of nontradables and in taxes collected in that sector.

The fourth term in equation (12) captures indirect welfare effects of a tariff reform that operates via changes in the level of employment and unemployment in the economy. If the change in the tariff increases (decreases) employment, welfare will also increase (decrease).[15] Notice that this labor market related channel has two separate effects. The first one $\bar{w}\, dL/d\beta$ refers to direct changes in employment, while the second one refers to the way in which changes in employment will impact on the collection of taxes on nontradables. Although it is not possible to sign this term under all possible conditions, there is a set of plausible assumptions (which we discuss below) under which it will be positive. This means that a tariff reform will increase the level of aggregate unemployment and will, thus, reduce welfare.[16]

The final term in equation (12), τR_{qp_B}, is a cross effect that captures the effect of the change in the tariff on the tax collections from

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[14] These conditions are that all goods are substitutes in demand and that the income effect of a change in tariffs is not dominate the substitution effects. See the Appendix.

[15] Rigorously this assumes either that factors other than labor cannot move across sectors or that nontradables is the most labor intensive sector.

[16] The simple conditions under which this is the case is that we are dealing with a Ricardo-Viner model with sector-specific factors of production.

the nontradables market, and is negative. Since all sectors compete for factors of production the lower (higher) tariff on goods B will result in a lower (higher) output of nontradable goods, increasing (decreasing) welfare.

Although in our general case with multiple distortions it is not possible to sign equation (12) in an unambiguous way, a number of insights can be obtained for more restrictive cases with fewer distortions. First, and as expected, it is clear from (12) that if the tariff on good B is the only distortion, a tariff liberalization will always be welfare enhancing. Moreover, in this case free trade will be optimal. Second, if tariffs on B and an economy-wide minimum wage are the only two distortions, it will not be the case any longer that a tariff liberalization reform will result in an increase in welfare. This clearly highlights the fact that in the plausible case of labor market distortions traditional results do not hold any longer.

A third and important implication of this analysis refers to the case in which tariffs on final goods A and B are the only two distortions in the economy. In this case a reduction of the higher tariff t^B, that moves the system towards uniformity, will always increase welfare. This is because, by assumption, $t^B > t^A$, and because the positive direct welfare effect stemming from the increase in imports of B due to the change on its own price will always exceed the indirect effect of that change on imports of good A. Furthermore, in this two-distortions case it is possible to find the optimal level of the tariff on B, for a given level of the tariff on A. It is instructive to conduct this exercise in terms of ad-valorem rather than specific tariffs. Denoting the ad valorem tariff on A by σ^A and that on B by σ^B, and noticing that $\sigma^A = t^A/p^{A*}$ and $\sigma^B = t^B/p^{B*}$ we have that the optimal σ^B is:

$$\tilde{\sigma}^B = \sigma^A\left[\frac{-p^{A*}(dI^A/dt^B)}{p^{B*}(dI^B/dt^B)}\right] \tag{13}$$

This is an important result since it gives us specific conditions under which uniform tariffs will be optimal. From the inspection of equation (13) it is apparent that uniform tariffs will be optimal if the term in brackets is equal to one. This will, in fact, be the case when there do not exist cross effects between importables and the other goods.[17]

An important question refers to the optimal tariff differential between goods A and B in the general case of multiple distortions. Formally this implies determining the optimal level of β. Manipulating our general model we obtain:

$$\tilde{\beta} = -\left(\frac{dI^B}{d\beta}\right)^{-1}\left[t^A\frac{dI^B}{d\beta} + t^A\frac{dI^A}{d\beta} + \tau R_{qp^B} + \tau R_{qq}\frac{dq}{d\beta} + (\tilde{w}+\tau R_{qL})\frac{dL}{d\beta}\right] \tag{14}$$

$$\qquad\qquad (-)\qquad (+)\qquad (-)\qquad\qquad (+)\qquad\qquad (-)$$

where the signs under the different terms of equation (14) are the ones expected to prevail under the most plausible conditions. By the same arguments discussed above, the optimal value of β cannot be signed without making further, and fairly restrictive, assumptions on the values of the key parameters involved.

An interesting implication of equation (14) is that it shows clearly that under most conditions the optimal (second best) value of β will <u>not</u> be zero. This result indicates that in this general setting there is <u>no</u> presumption that uniform tariffs (i.e., $t^A=t^B$) will be optimal. It would indeed be an enormous coincidence if the different effects captured by the right hand side of this equation would exactly cancel each other in order to

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[17] With only two goods the terms in brackets is equal to one by the Slutzky adding up condition. See Bertrand and Vanek (1971).

yield $\beta = 0$ as the solution of the optimizing problem. Moreover, it is apparent from (14) that, contrary to the case where tariffs are the only distortion (Chambers (1989)) in an economy with multiple distortions there are no specific functional forms of the (net) expenditure function that will result in tariff uniformity being optimal. The reason, of course, is that in this more general case indirect real exchange rate and employment effects introduce additional terms into the optimal wedge equation whose magnitudes will not (only) depend on the specific form of the expenditure function.

Is Free Trade Optimal?

Until now the discussion has been carried out under the (implicit) assumption that the final levels of the tariffs on both importable goods are positive. Thus, we have addressed the issue of whether uniform but positive tariffs are optimal. An alternative and very important question is to investigate the optimality of uniform tariffs that are equal to zero; that is, the optimality of free-trade. In order to address this question we amend the model in the following way: we now assume that the tariff on A is initially zero and we ask what will be the optimal (second best) level of the tariff on B. Of course, in order for this exercise to have some meaning we need to assume that there are other distortions in the economy. Thus, we maintain our assumption of distorted nontradables and labor markets.

In this case the expression for the optimal tariff on the B good looks quite similar to that previously obtained for the optimal β in equation (14):

$$\tilde{t}^B = -\left(\frac{dI^B}{dt^B}\right)^{-1} \left[\tau\left(R_{qp^B} + R_{qq}\frac{dq}{dt^B}\right) + \left(\bar{w}+\tau R_{qL}\right)\frac{dL}{dt^B}\right] \qquad (15)$$

Generally speaking, this expression will not be zero. Moreover, under most circumstances it will be positive, indicating that in our second best setting free trade will not be optimal. This result of an optimal (second best) positive tariff on B stems from the fact that both the indirect real exchange rate and employment effects have a positive sign. This, of course, is nothing more than a formulation in a very general setting of the classic results postulated by Haberler (1950), Lipsey and Lancaster (1956), and others, with respect to the non-optimality of free trade under multiple distortions.

The analysis of equation (15) shows quite clearly that even in this simplified case policymakers would have a very difficult time figuring out the actual level at which the optimal tariff on B, ($\tilde{t}^B$), should be set. In fact, the amount of information required to obtain empirical counterpart of equation (15) is staggering. Students of structural reform in the developing countries are indeed well aware that it is extremely difficult to obtain information on the real exchange rate and employment consequences of a trade reform.

V. Optimal Trade Policy in the Presence of Imported Intermediate Inputs

The analysis developed in the previous section has shown that, generally speaking, in a world with final goods only a uniform import tariff will be optimal only under very special and restrictive circumstances. However, most of the policy debate on uniform tariffs has been carried out under the (more realistic) assumptions of the existence of imported intermediate inputs that are also subject to tariffs. In fact, much of the discussion on the issue has been carried out in terms of effective rates of protection.[18] For example, Harberger's recommendation of uniform import tariffs is based on the idea that uniform nominal tariffs will generally tend to result in uniform effective rates of protection. According to him:

> Any import tariff that is imposed should be uniform ... The motivation for this recommendation stems from the theory of effective protection ... (Harberger, 1984, p. 12)

Harberger's view on the desirability of uniform tariffs is, however, far from being universally accepted. For example in an early essay on trade policies in the developing world, Harry Johnson pointed out:

> [T]hough equalization of effective rates of protection will tend to equalize the marginal social cost of protection in all lines, this is not a valid standard for minimization of the social cost of protection, since protection imposes a consumption cost through the distortion of consumers' choices and there is no reason to think that the marginal consumption cost will be equalized by equal effective rates of protection.
>
> (Johnson, 1972, p. 318)

The purpose of this section is to investigate, within our general equilibrium framework with several distortions, whether uniform (nominal) tariffs are optimal in a (second best) welfare sense in a world with

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[18] Notice, however, that a number of authors have criticized the use of ERPs in policy design and evaluation because they are fundamentally a partial equilibrium concept.

imported intermediate inputs.[19] We do this by adding an (importable) intermediate good to our benchmark model of Section III. We assume that this intermediate good (i) is used in the productive process of both importables A and B and of the exportable good, and that it is not directly demanded by consumers. Since the importation of the intermediate commodity is assumed to be subject to a tariff t^i, its domestic price is given by $p^i = p^{*i} + t^i$. For the purpose of the different exercises conducted below we assume that $t^B > t^A > t^i$. More specifically, we consider the case where $t^A = t^i + \theta$. Another important assumption is that (at prevailing prices) domestic production of good i is not sufficiently large as to cover its total (derived) demand. Consequently, at every moment in time the amount imported of commodity i is positive.

Formally, in order to include intermediate inputs in our benchmark model it is necessary to distinguish <u>gross</u> output from <u>net</u> outputs. Defining by a_{ij} the input-output coefficient corresponding to good j, the relationship between gross output (S_j) and net output (s_j) of good j is given by:[20]

$$s_j = (1-a_{ij})S_j \tag{16}$$

The new revenue function ρ is then defined as the maximum value added (or net output) that optimizing firms can obtain at given prices and available technology:

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[19] Bertrand and Vanek (1971) also discuss the welfare consequences of tariff changes in the presence of intermediate inputs.

[20] There is no need in the analysis for the a_{ij}'s to be constant. If there is substitutability a_{ij} in equation (16) above should be interpreted as the <u>optimal</u> amount of commodity i used in the production of a unit of good j. See, for example, Dixit and Norman (1980) for a more detailed discussion of net and gross outputs.

$$\rho = \rho(1, p^A, p^B, p^i, q, L(\ )) \tag{17}$$

The properties of this "net output" revenue function ρ are almost the same as those of the conventional revenue function given by equation (3). The function is convex and its derivatives with respect to goods' prices are equal to the net output of each good. The derivatives with respect to factors of production, on the other hand, will also give the marginal product of that factor. Finally, our assumption that there always are net imports of the intermediate good implies that the net output of this type of good is negative: $\rho_{p^i} < 0$.

The budget constraint (6) is now replaced by the following expression:

$$\rho(1, p^A, p^B, p^i, q, L(\ )) + t^A I^A + t^B I^B + t^i I^i + rRq = E(1, p^A, p^B, f, U) \tag{6'}$$

where I^i represents imports of intermediate inputs, and is given by

$$I^i = -\rho_{p^i}. \tag{18}$$

Notice that the fact that the (domestic) price of intermediate goods does not appear in the right hand side of equation (6') is a reflection of our assumption that these goods are used exclusively as inputs and are not consumed by households.

In this setting the first exercise will be to determine the welfare effects of lowering the tariff on the final good B, t^B, maintaining tariffs on final good A and on the intermediate good constant. A simple manipulation of our model yields an expression that is formally similar to (12):

$$E_u \frac{dU}{dt^B} = t^B \left(\frac{dI^B}{dt^B}\right) + t^A \left(\frac{dt^A}{dt^B}\right) + t^i \left(\frac{dI^i}{dt^B}\right) + rR_{qq} \left(\frac{dq}{dt^B}\right) + (rR_{qL} + \bar{w}) \frac{dL}{dt^B} + r\rho_{qp^B} \tag{19}$$

(-) (+) (+) (+) (+) (+) (-)

Since the interpretation of equation (19) is in many ways similar to that of

equation (12), the discussion on the expected signs of the different terms will be short. As before, the first term is the direct welfare effect stemming from changes in the level of imports of the final goods and its sign is negative. The second term, which also appeared in equation (12), is the indirect effect provoked the cross reaction imports of of good A of the change in t^B and is generally positive.

The third term $t^i (dI^i/dt^B)$ did not appear before and is a consequence of our new assumption regarding the existence of intermediate goods. The term can be rewritten as $-t^i[\rho_{p^i p^B} + \rho_{p^i q} (dq/dt^B) + \rho_{p^i L} (dL/dt^i)]$, and its sign will depend on the characteristics of the production technology used in the country, and on the real exchange rate and employment effects. Under most circumstances $\rho_{p^i p^B}$ will be negative, indicating that higher prices of the intermediate inputs will result in lower production of the final good B. For the same reason $\rho_{p^i q}$ will be negative, and since dq/dt^B is assumed to be positive, the second term as a whole will be negative. The third term is an employment effect and under Ricardo-Viner assumptions it is positive. Although it should be noticed that we cannot sign dI^i/dt^B unequivocally, for purposes of our discussion we will assume that it is positive: that is, we assume that an increase in the price of the imported input results in a decline in the output of final goods. In terms of a liberalization program this means that a reform aimed at reducing the highest tariff on final goods will generate some negative welfare effects via its impact on the importation of intermediate goods.

The rest of the terms in equation (19) have the same interpretation and signs as those of equation (12) and, thus, we will not repeat the discussion on them. It is worthwhile emphasizing, however, that as was the case in equation (12), the unemployment and real exchange rate terms will play a key

role in determining the welfare consequences of a reform aimed at lowering tariffs of the final goods.

The main result of this analysis is that adding imported intermediate goods does not alter the conclusions obtained from the case that only considered final goods: generally speaking we cannot assert that lowering the highest tariff on final goods will increase welfare in the presence of intermediate inputs and multiple distortions. However, in the previous section we showed that under a special set of assumptions -- tariffs being the only distortion and limited substitutability across sectors -- uniform tariffs were optimal. Let us analyze that case again: assuming as given the tariffs on the final good A and on the intermediate good, and that there are no distortions, we ask what is the optimal (second best) tariff on good B. From equation (19) we have that:

$$\tilde{t}^B = t^A\left(\frac{dI^A/dt^B}{-dI^B/dt^B}\right) + t^i\left(\frac{dI^i/dt^B}{-dI^B/dt^B}\right) \tag{20}$$

which can be rewritten, in terms of ad valorem tariffs in the following way:

$$\tilde{\sigma}^B = \sigma^A \frac{p^{*A}}{p^{*B}}\left(\frac{dI^A/dt^B}{-dI^B/dt^B}\right) + \sigma^i \frac{p^{*i}}{p^{*B}}\left(\frac{dI^i/dt^B}{-dI^B/dt^B}\right) \tag{21}$$

An important implication of equation (21) is that in the (rather special) case in which the change in the tariff on good B has no effect on exportables or nontradables, the optimal ad valorem tariff on B ($\tilde{\sigma}^B$) will be a weighted average of the ad valorem tariffs on the final good A and on the intermediate good i. This is because in this special case in which the change in t^B does not provoke (either directly or indirectly) a change in exports, balanced trade will require that the sum of the changes in all imports add to zero, when valued in foreign currency. In terms of our model

this means that:

$$p^{B*}\frac{dI^{B}}{dt^{B}} + p^{I*}\frac{dI^{A}}{dt^{B}} + p^{i*}\frac{dI^{i}}{dt^{B}} = 0,$$

$$(-) \qquad (+)$$

and thus $\tilde{\sigma}^{B}$ becomes a weighted average of σ^{A} and σ^{i}. Interestingly enough, this implies that if the initial ad valorem tariffs on A and B are equal, uniform tariffs will be optimal. However, if these rather restrictive conditions are not met, uniformity will not be optimal in a second best sense.

Assume now that, instead of changing the tariff on a final good, the tariff reform consists on a change of the intermediate goods tariff t^{i}. In this case the general expression for the change in the economy's welfare would be given by:[21]

$$E_{u}dU = t^{i}\left(\frac{dI^{i}}{dt^{i}}\right) + t^{B}\left(\frac{dI^{B}}{dt^{i}}\right) + t^{A}\left(\frac{dI^{A}}{dt^{i}}\right)$$

$$\tau R_{qq}\left(\frac{dq}{dt^{i}}\right) + (\tau R_{qL}+\tilde{w})\frac{dL}{dt^{i}} \qquad (22)$$

Although this expression looks very much like that obtained in our previous analysis (see equation (12)), the interpretation of some of the right hand side terms is rather different. For instance, the first term in equation (22) can be written as:

$$-t^{i}\left[\rho_{p^{i}p^{i}}\rho_{p^{i}L}\frac{dL}{dt^{i}} + \rho_{p^{i}q}\frac{dq}{dt^{i}}\right].$$

where $\rho_{p^{i}p^{i}}$ is positive by convexity of the revenue function, $\rho_{p^{i}L}$ is also positive and dq/dt^{i} cannot be signed. For purposes of focusing the

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[21] Notice, however, that since intermediate goods are not used in the production of nontradables we do not have a term reflecting the effect in the nontradables market.

discussion, however, we will assume that $t^i (dI^i/dt^i)$ is as a whole negative. This plausible assumption implies that a hike in the tariff of the intermediate good i will reduce its imports. The second and third terms capture the change in imports of A and B provoked by the change in the tariff on the imported input. As before, the change in total welfare will depend on the direction in which I^A and I^B move as a result of the change in t^i. Although in this case it is more difficult to sign these expressions, we can still assume that under the most plausible set of conditions they will be positive.[22]

The interpretation of the real exchange rate effect in equation (22) $\tau R_{qq}(dq/dt^i)$, however, will not be the same as before. As was noted by Harry Johnson (1966), it is not possible to know a priori how the equilibrium real exchange rate will move when there are changes in the tariffs of intermediate inputs. Finally, the labor market term has the same interpretation as before and is positive. The analysis of equation (22) adds, then, robustness to our previous findings. In the more general case of an economy with several distortions and imported intermediate inputs, we cannot state unequivocally that a move toward greater tariff uniformity will improve welfare. In fact, tariff uniformity will be a (second best) optimal result only under a set of very special and restrictive assumptions.

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[22]Formally in the case of good A we have that:

$$\frac{dI^A}{dt^i} = (E_{p^A q} - \rho_{p^A q}) \frac{dq}{dt^i} + E_{p^A u} \frac{du}{dt^i} - \rho_{p^A p^i} - \rho_{p^A L} \frac{dL}{dt^i} \gtrless 0.$$

VI. Trade Liberalization With A Government Budget Constraint

The benchmark model of Section III and the exercises of Sections IV and V followed conventional trade theory by assuming that tariffs and other tax proceeds are handed back to the public in a nondistortionary fashion. Although this is a convenient assumption for theoretical discussions, it is far from realistic. In fact, in the real world many countries, and especially some of the poorer ones, rely quite heavily on import tariffs to raise government revenue. Indeed, in a recent paper, Cheasty (1990) has stated that unless structural adjustment programs are accompanied by a hike in other taxes, serious fiscal imbalances would result in most developing countries.

In this section we extend the benchmark model to the case where the government does not hand back tax proceeds, but uses them to finance an exogenously given level of expenditures. In order to simplify our exposition we now assume that there is only one importable sector, subject to an import tariff equal to t.[23] The more general case of many importables -- including intermediate inputs -- can be obtained quite easily by extending the model along the lines of the analyses presented in the preceding pages. We maintain, however, our assumption of distortions in the nontradables sector and of a minimum wage rate above its equilibrium level.

In this case the model becomes:

$$R(l,p,q,L(\ )) = E(l,p,f,U) \tag{23}$$

[23] The important study of Ramaswami and Srinivasan (1968) discussed some aspects of tariff policies in the presence of budget constraints. They consider, however, the case of two intermediate imported inputs, nontradables and exportables. Their analysis also dealt with the appropriate level of export drawbacks.

$$Rq = Eq \tag{24}$$

$$f = q + \tau \tag{25}$$

$$p = p^* + t \tag{26}$$

$$G = \tau Rq + tI \tag{27}$$

$$I = E_p - R_p \tag{28}$$

The main difference between this version and the benchmark model is given by equations (23) and (27), which capture the assumptions that the government uses the tax proceeds to finance its expenditure instead of handing them back to households. In fact, equation (27) states that the sum of revenues from tariffs and taxes on nontradables are used to finance government expenditure G.

In this setting, if we assume that government consumption G is constant, a tariff liberalization reform that reduces the level of t will require an adjustment in other sources of government revenue. Since in our model these alternatives are restricted to taxes on nontradables, a tariff liberalization will necessarily result in an increase in the tax rate τ.

By totally differentiating equation (27) we can find the relationship between tariffs (τ) and taxes on nontradables (t) that is compatible with maintaining a constant level of government consumption $\bar{G}$:

$$\left.\frac{d\tau}{dt}\right|_{dG=0} = \frac{-I}{Rq}(1+\eta) - \left(\frac{\tau}{q}\right)\epsilon\,\frac{dq}{dt} \tag{29}$$

where $\eta = (t/I)(dI/dt)$ is the tariff (price) elasticity of the demand for imports and is negative, and where $\epsilon = (q/Rq)R_{qq}$ is the supply elasticity of nontradables.

The sign of equation (29) is generally undetermined, and will depend on what region of the tariff "Laffer curve" the country is initially located. The first term on the RHS $-(I/Rq)\ (1+\eta)$ refers to the maximum revenue tariff, and its sign will depend on whether $|\eta| \gtrless 1$. If the initial import tariff is below the maximum revenue tariff $|\eta| < 1$, the this first term $-(I/R_q)\ (1+\eta)$ will be negative. This means that, due to this effect, a tariff liberalization that lowers the tariff t will require an increase in the tax on nontradables in order to maintain government revenue constant. The second term $-(\tau/q)\ \varepsilon(dq/dt)$ in equation (29) captures the indirect effect of the tariff change on government revenue from the taxation of nontradables. A tariff increase will (generally) provoke an increase in the price of nontradables which, in turn, will result in higher production of N and, consequently, in an increase in the tax revenues in that sector at the given initial tax rate τ. The sign of this second term is, thus, negative.

The sign of our equation (29) as a whole will, thus, depend on the magnitude of the elasticity η. If initially import tariffs are not "too high", and do not exceed the maximum revenue level, η will be significantly below one and the sign of (29) will be negative. This means that in order to maintain G constant, it will be necessary to raise taxes on nontradables at the same time as tariffs are lowered. In order to organize the presentation, in the rest of this section we will assume that this is indeed the case and that initially the country in question is on the "right side" of the Laffer curve and, thus, that the sign of $d\tau/dt|_{dG=0}$ in equation (29) is negative.

With a binding government budget constraint the expression for the welfare effect of a tariff reform is quite different from that discussed in Sections IV and V above:

$$E_u \frac{dU}{dt} = -(E_p - R_p) + \dot{w} \frac{dL}{dt} - E_f[(I/R_q)(\eta+1) + (r/q) \in \frac{dq}{dt}] \qquad (30)$$

The first term in (30) is the direct effect of the tariff change and is negative. This means that a tariff reform that reduces t will generate a direct positive welfare effect equal to minus the initial level of imports. The second term is the indirect welfare effect operating through the labor market. It will be positive or negative depending on whether the tariff reform results in an increase or reduction of employment. Although in the preceding sections we assumed that this term was positive, this need not be the case under most circumstances. In fact, as is shown in the accompanying paper "Structural Reforms and Labor Market Adjustment" in a country with an economy-wide minimum wage the change in employment resulting from a tariff change is equal to:

$$\frac{dL}{dt} = L_p + L_q(\frac{dq}{dt}) \qquad (31)$$

where L_p and L_q are the price derivatives of the employment function. Their sign, in turn, will depend on whether we are referring to a Ricardo-Viner factor specific model or to a Heckscher-Ohlin framework with full factor mobility. In the former both L_p and L_q will be positive, while in the latter case their signs will depend on the relative factor intensities of the different productive sectors.[24] If we assume, as before, that we are in a Ricardo-Viner world, (dL/dt) will be positive, indicating that a liberalization will exert a negative impact on welfare via this employment channel.

The last term in equation (30) $E_f[(I/Rq)(\eta+1) + (r/q) \in dq/dt]$ captures the indirect welfare effects stemming from the existence of a binding government constraint. Under our assumption that initially tariffs

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[24] See Edwards and Edwards (1989).

are not "too high" this last term will be negative. The sign of the welfare change equation as a whole is, thus, undetermined. This is so even if we assume that there are no labor market distortions and that $dL/dt = 0$. In this case whether a tariff reform will have a positive or negative impact on the economy's welfare will depend on the different elasticities involved, including the elasticity of the real exchange rate with respect to tariff changes. Naturally, the more distortive the alternative sources or revenue are, the lower the possibility that a tariff reform will be welfare enhancing. From a policy perspective this means that policymakers should clearly evaluate the impact of a reform on government's revenues. In terms of sequencing, this analysis suggests that it would generally be desirable to implement a tax reform that would increase the degree of efficiency of the revenue sources other than tariffs, at the same time as the liberalization program is enacted.

VII. Concluding Remarks

The objective of this paper has been to provide a unified analytical framework for studying the desirability, from a welfare perspective, of uniform import tariffs. The analysis presented here has expanded previous research in the area by considering this issue in an economy with several distortions, thus focusing the discussion on the second-best characteristics of the optimal protective structure.

The paper started with a brief literature review of the optimal tariff structure. Then, in Section III we developed a general equilibrium framework of an optimizing economy with several distortions to investigate the welfare consequences of alternative structural reforms. The model considers an economy with two importable sectors subject to import tariffs, an imported intermediate input, a distorted labor market and a nontradable sector subject to a consumption tax. In Sections IV and V we use the model to evaluate the consequences of tariff reforms aimed at moving the economy to lower and more uniform rates of protection. In evaluating the desirability of uniform tariffs we investigate how alternative reforms affect welfare of the representative consumer. Then in Section VI we investigate how the presence of a binding government budget constraint affects the results obtained in the preceding sections.

The main message of our analysis is that, from a theoretical point of view, uniform tariffs are optimal only under a set of very restrictive assumptions. This is true independently of whether we consider an economy with only final goods or if we incorporate the existence of imported intermediate inputs. Additionally, our analysis shows that changes in real exchange rates and in labor market conditions play a key role in determining the likely effects of alternative tariff structures on welfare.

If uniform tariffs are generally not optimal, what is the theoretically (second best) optimal structure of protection? We show that in a general equilibrium setting the optimal level of tariffs will depend on a score of considerations including the magnitude of the other (nontariff) distortions, real exchange rate changes, technological characteristics of the different sectors (including their relative factor intensities), and labor market configuration. What is particularly important, however, is that the information required to design an optimal (second best) protective structure is staggering, and is generally not available to analysts or policymakers. This practical issue cannot be underestimated, since in the real world economic authorities have to make decisions about the appropriate structure of tariffs using fairly incomplete and fragmentary information. This suggests that an important subject for further research would be to develop broad "rules of thumb" that could be used in specific reform episodes to design the tariff schedule. The analysis presented here does provide some preliminary information to this effect. For example, from our discussion in Sections IV and V it follows that if the real exchange rate changes and the unemployment increases provoked by a tariff reform are "small", a uniform tariff structure is <u>likely</u> to move us closer to a second best optimum.

Finally, it should be noted that the analysis presented here can be extended in various directions to gain further insights on the uniformity issue. A particularly interesting extension refers to dynamic aspects of uniformity. For example, an intertemporal (e.g., two periods) version of the benchmark model could be developed to inquire whether tariffs that are uniform (at a positive or zero level), through time are desirable, or whether a particular intertemporal configuration of protection is more desirable than any other.

APPENDIX

Tariffs Changes and Real Exchange Rates

In order to maintain the exposition at a simple level, the model presented in the paper has not been fully solved. In particular, a reduced form expression for changes in the real exchange rate provoked by a tariff reform was not presented. In this Appendix this is done for the simple case when there is only one importable good and an economy-wide minimum wage is the only other distortion besides the tariff. Denoting the relative price of nontradables to exportables as q (since there are no taxes in this sector) and defining the constrained revenue function ($\tilde{R}$) as:

$$\tilde{R}(\bar{w},p,q,K) = \max_{y,L} \left\{\left[y^X+py^M+pq^N\right] - \bar{w}\right\}$$

where y^i, $i = X,M,N$ refers to output of exportables, importables and nontradables. The nontradable market equilibrium condition, on the other hand, is replaced by:

$$\tilde{R}_q = E_q \qquad (A.2)$$

where $\tilde{R}_q$ is the partial derivative of the constrained revenue function (A.1) with respect to the price of nontradables. Neary (1985) has shown that under fixed factor prices the following relation exists between restricted and unrestricted revenue functions:

$$\tilde{R} = R[p,q,\tilde{l}(\bar{w},p,q,K)] - \bar{w}\tilde{l}(\bar{w},p,q,K) \qquad (A.3)$$

where $\tilde{l}$ is the amount of labor employed in the constrained case. In this simplified setting and taking into account the above relations it is easy to derive an expression that shows the way in which the relative price of nontradables reacts to a tariff reduction in an economy with factor specificity

and fixed real wages. In order to facilitate the comparison with the case of flexible factor prices the term $d\tilde{q}/dt$ is expressed in terms of the derivatives of the unconstrained revenue function:

$$\frac{d\tilde{q}}{dt} = \frac{E_W}{\tilde{\Delta}} \{[tC'_N E_{pp} - R_{pp}) - (1-tC'_M)(R_{pq} - E_{pq})]$$

$$+ [(R_{\ell p_N}/R_{\ell\ell})tC'_N + (1-tC'_M)[R_{\ell q}/R_{\ell\ell}]]\} \qquad (A.4)$$

where $\tilde{\Delta} = \Delta - \{t(R_{\ell p}/R_{\ell\ell})C'_M)(R_{\ell q}R_{\ell\ell})\}$,

$$\Delta = E_W \{t(R_{qp} - E_{qp})C'_N - (1-tC'_M)(E_{qq} - R_{qq})\} > 0$$

and $CN = E_{qw}/E_W$, $C'_M = E_{pw}/E_w$ are pure income effects on the demands for nontradables and importables.

Since $R_{\ell p}, R_{\ell q} > 0$ and $R_{\ell\ell} < 0$ it follows that $\tilde{\Delta} > \Delta$, which implies that:

$$\frac{d\tilde{q}}{dt} < \frac{dq}{dt} \qquad (A.5)$$

That is, with an economy-wide minimum the equilibrium relative price of nontradables (and, thus, the equilibrium real exchange rate) will be less responsivel to a tariff liberalization. Even in this simple setting, then, it is possible to have a number of pseudo-paradoxes where changes in tariffs can result in an equilibrium real depreciation with wage flexibility, but in a real appreciation with wage rigidity. Naturally, once the reduced form for the real exchange rate is obtained, it is easy to find the reduced form expressions for changes in welfare stemming from a given reform. Notice, however, that as more distortions are included it becomes much more difficult to unequivocally sign these expressions.

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