research paper series

Globalisation and Labour Markets

Research Paper 2003/06

Effective Protection, Policy Appraisal and Trade Policy Reform

By D. Greenaway and C. Milner

The Centre acknowledges financial support from The Leverhulme Trust
under Programme Grant F114/BF

The Authors

David Greenaway is Professor of Economics and Director of the Leverhulme Centre for Globalisation and Economic Policy at the University of Nottingham; Chris Milner is Professor of International Economics and an Internal Research Fellow of the Leverhulme Centre for Globalisation and Economic Policy, University of Nottingham.

Acknowledgements

The authors are grateful for financial support from the Leverhulme Trust under the Programme Grant F114/BF.

An earlier draft of this paper was presented at *'Trade, Exchange Rate Regimes and Growth: A Conference in Honour of Max Corden'*. School of Advanced International Studies, Johns Hopkins University, Washington DC, April 19th 2002. The authors are grateful for comments from the paper's Discussant, Will Martin, as well as observations from Max Corden, Ron Jones, Peter Neary and Martin Wolf.

Effective Protection, Policy Appraisal and Trade Policy Reform

By

D. Greenaway and C.R. Milner

Abstract

When the effective protection concept was first developed it was widely regarded as a key measure of the structure of protection and became widely deployed. It was however subject to a theoretical critique on the grounds that it was essentially a partial equilibrium measure, which could not be easily embedded in a general equilibrium framework. Notwithstanding this critique, the concept has continued to be widely used, especially in the context of policy reform and policy appraisal in developing countries. This paper re-appraises the concept, reviews the extent of its application and discusses the factors behind its longevity as an investigative tool. The paper concludes that the measure still has a role to play in evaluating the structure of protection.

JEL: F1

Keywords: protection, trade policy

Outline:

Non-technical summary:

The concept of effective protection was first developed as a device for summarising the total effect of input and output tariffs on a production process. It quickly became established as a widely used tool for evaluating protective structures and changes therein, especially in developing countries. However, at a very early stage, the concept was subject to criticism on the grounds that it is inappropriate to draw general equilibrium inferences from a measure that is essentially partial equilibrium. Yet, despite this critique, the measure still continues to be widely used by academic researchers and policy-making agencies. This paper explains why. We argue that the effective protection concept has not been used despite, or in disregard of, the theoretical critique. Rather, the manner in which empirical estimates have been used and interpreted, especially in a developing country context, has exploited the fundamental utility of the concept. So much so, that there are circumstances where it still dominates its alternative, CGE modelling. To illustrate this, we review the use of effective protection measures in policy appraisal and trade policy reform in developing countries. We argue that the durability of the concept can be explained by three factors. First, although it is clearly not a general equilibrium concept, it does force policy analysts and policy-makers to think in general equilibrium terms. Second, it is a comparatively simple concept to understand. Third, it is a robust indicator of relative protection across sectors.

"Building on the blueprint of theorists such as Corden (1966), a generation of applied economists have calculated effective rates of protection in cheerful disregard of the critique of the design best summarised by Ethier (1977)."

Anderson (1998), page 21.

1. Introduction

Max Corden made seminal contributions to the theory of effective protection, most notably Corden (1966) but also Corden (1969) and (1971a). As Max acknowledges in an Appendix to *The Theory of Protection* (Corden 1971b), he did not discover a new concept as such; economists including Taussig, Haberler and Meade, as well as practitioners, were aware that in thinking about protection it was a mistake to focus on output tariffs, ignoring input tariffs. But Corden was among the first to articulate the concept systematically and to articulate it in such a way as to provide a coherent analytical framework to applied economists and policy makers. And those papers have stimulated an enormous literature. Indeed it is doubtful whether any other single contribution, in a long and distinguished career, has stimulated more work. There is certainly nothing which has contributed more to policy appraisal/policy reform.

That the concept has had such an influence and been estimated so extensively is, for some, surprising on the grounds that it is 'fatally flawed'. That was certainly the view of Bhagwati and Srinivasan (1973), Ethier (1977) and Anderson (1998) among others. Yet it has not only survived such critiques; as an input into applied trade analysis it has flourished. Is it because, as Anderson argues, "…. *applied economists have calculated effective rates of protection in cheerful disregard of the critique* ….." or is it because "the critique" itself missed some important points? That is the focus of this paper, the remainder of which is organised as follows: Section II reviews the basic effective protection concepts and the critique of their design. Section III surveys the literature on effective protection in policy appraisal and Section IV its role in policy reform. In both these Sections we pay particular attention to the way the measure has been used. Section V then addresses the obvious question of why the concept has been so widely deployed and Section VI concludes.

2. Effective Protection Concepts

The Basic Concept and Key Insights

As noted above, the intuition behind effective protection pre-dates the work of Corden and others. But, of course, effective protection is far from unique in that regard. Many of our most important ideas are stimulated by observation. In this particular case Corden was one of the first to develop and explain the concept, which he did most elegantly and clearly in his 1966 paper. The basic geometry and algebra are straightforward and are now fixed points in undergraduate trade programmes. Following Corden (1971b):

$$p_v = p_j\left(1 - a_{ij}\right) \tag{1}$$

$$p_v^{'} = p_j\left[\left(1 + t_j\right) - a_{ij}\left(1 + t_i\right)\right] \tag{2}$$

$$g_j = \frac{p_v^{'} - p_v}{p_v} \tag{3}$$

and from (1), (2) and (3)

$$g_j = \frac{t_j - a_{ij}t_i}{1 - a_{ij}} \tag{4}$$

where,

p_v = value added per unit of fined good j at free trade prices;
$p_v^{'}$ = value added per unit of j at tariff distorted prices;
g_j = effective protective rate for activity j;
p_j = nominal price per unit of j at free trade prices;
a_{ij} = share of i is cost of j at free trade prices;
t_j = nominal tariff rate on j;
t_i = nominal tariff rate on i.

Equation (4) is a standard core result familiar to any student of international trade. It tells us that effective protection of an activity depends upon tariffs on outputs and inputs and on the free trade input share in the following ways:

If:

$$t_j = t_i \Rightarrow g_j = t_j = t_i \quad \text{(i)}$$

$$t_j > t_i \Rightarrow g_j > t_j > t_i \quad \text{(ii)}$$

$$t_j < t_i \Rightarrow g_j < t_j < t_i \quad \text{(iii)}$$

$$t_j < a_{ij} t_i \Rightarrow g_j < 0 \quad \text{(iv)}$$

All of the fundamental insights of effective protection are revealed by this simple and transparent piece of analysis. These are:

- value added in a given production process is the appropriate focus when evaluating the supply side impact of tariffs;
- the overall tariff structure has both a tax and subsidy element; whereas tariffs on the final good operate as a subsidy, tariffs on imported inputs operate as a tax;
- overall protection to value added depends upon the interplay between output and input tariffs and the share of imported inputs in production costs.
- effective protection can be negative as well as positive, leaving a particular activity worse off (relative to free trade), as a consequence of protection.
- Although $0 < a_{ij} < 1$ is the usual case, it is possible to have a situation where $a_{ij} > 1$, in other words for the value of imported inputs to exceed the value of outputs, (at free trade prices), so-called negative value added.

This framework guided economists to think systematically about the overall tariff structure. Equally important, it provided policy analysts with a framework for evaluating the structure of protection. In the process it offered a coherent explanation for the effects of the widely observed phenomenon of *tariff escalation*. Since it is hard to find a tariff structure anywhere, where escalation is not evident, this is a major contribution. Finally, the basic framework also anchors two other commonly observed empirical phenomena, *negative effective protection* and *negative value added*. The former is widespread, even endemic.

Its importance derives not only from highlighting how an activity might be worse off as a consequence of protection, even when tariffs on its output are positive, but also in highlighting how systematic biases can arise. Because export-oriented activities are often subject to tariffs on inputs and will not benefit from tariffs on exported outputs, anti-export bias in the tariff structure can arise. This has been a key contribution of the effective protection literature, as we shall see later. As Krueger (1997) acknowledges in her *AEA Presidential Address*, effective protection was a key input to subsequent work on trade policy in developing countries which in turn was so important to the process of trade policy reform. Although the phenomenon of negative value added is less common in practice, it too has been influential, flagging up how chaotic import-substitution regimes can drive bizarre outcomes. (For a summary of evidence on negative value added see Greenaway and Milner 1993)[1].

The Theoretical Critique

The initial work on effective protection stimulated a literature which quite simply exploded. To see how quickly, consult the list of references in Corden (1971), having regard to the fact that the volume was published just five years after Corden's seminal paper and we had far fewer journals (with fewer issues) then than now. Some of the initial work was empirical implementation, which we come to later. Quite a lot was directed at dissecting the concept and subjecting it to close scrutiny, examining in particular whether the key results survive in general equilibrium. This body of work we refer to as 'the theoretical critique'. Those papers which were most influential in challenging the utility of the concept were Jones (1971), Ethier (1971, 1972, 1977), Bruno (1973), Khang (1973) and Bhagwati and Srinivasan (1973).

The theoretical critique of the effective protection concept derives largely from concerns about drawing general equilibrium inferences from a partial equilibrium measure but also in part from its perceived deficiencies, even as a partial equilibrium measure. The most serious of the latter is probably the presence of non-traded inputs, which do not figure in the analysis of nominal protection. Their treatment ultimately depends upon whether they

[1] Of course, in developing, extending and explaining the concept, Corden went much further than his seminal (1966) paper, in Corden (1969), (1971) and (1985). We will return to these later.

are inputs into traded intermediates or not. If they are not, then any non-traded inputs should be aggregated with value added; if they are, they should be aggregated with traded inputs. Ultimately this is a practical issue, since non-traded inputs can easily be embedded in theoretical models, as demonstrated by Ray (1973).[2]

The same cannot be said of the general equilibrium criticisms. Conceptually these derive from two separate but linked considerations, most commonly referred to as the substitution problem and the scale problem. A key assumption of the basic effective protection model is fixed coefficients, or separability in the production function. If there is any substitutability between primary factors and intermediates, three problems arise. First, as Corden (1971) shows, measured effective rates will typically overstate actual rates; second, gross outputs will no longer change to the same extend as value added products, indeed theoretically they may even move in opposite directions; third, actually defining value added product becomes problematic. Fundamentally the first is actually a practical problem which may require measurement using 'free trade' rather than 'protected prices'. The key problems are the second and third, the implications of which have been worked through by Ethier (1971), (1972), Bruno (1973), Khang (1973) and Bhagwati and Srinivasan (1973). It is clear from this analysis that substitutability undermines the neat and tight conclusions of the original analysis.

The scale problem is often lumped together with the substitution problem, though conceptually it is separate, insofar as it applies to nominal as well as effective tariffs. Simply stated, one cannot infer anything systematic about actual resource pulls from knowledge of a scale of effective tariffs alone. The predictive content of effective rates is therefore vacuous.

These sound like fairly devastating criticisms for a concept which is meant to be an aid to trade policy evaluation – are they? The answer must surely be in theory yes; in practise possibly. There is no doubting the veracity of the conclusions from theory is pointing up the limitations of effective protection. But another way of looking at it is that it also tells us 'where the bodies are buried', i.e. it tells applied economists what to look out for. The

---

[2] Adjustments can variously be made according to the Corden, Balassa and Scott methods, as explained in Balassa (1982).

issue then becomes one of establishing whether, in practise, the substitution problem really is a problem, and if so how big a problem. At any rate, all of these problems were well known by the mid-1970s, yet 25 years of measurement has followed.

3. Effective Protection in Policy Appraisal

Why, despite the criticisms by influential theorists, have a generation of applied trade economists (including the present authors) made such extensive use of the concept? Have these applications of effective protection and the interpretation of the resulting estimates been liable to the criticism summarised by Anderson (1998)? In what follows we argue that the extensive usage of effective protection estimates is not despite nor in disregard of the theoretical challenges. Rather the manner in which the empirical estimates have in general been used and interpreted to analyse trade policy, especially in a developing country context, has exploited the fundamental utility of the concept, and we will argue that there continue to be circumstances where it dominates its alternative, CGE modelling.

The incidence and relative utilisation of effective protection applications

The effective protection concept has been *very* widely used indeed. This is especially so for developing countries, where it is been applied probably more widely than any other concept or measure of the incentive structure[3]. Its tractability and relatively more parsimonious data demands than some other concepts and modelling frameworks (e.g. domestic resource cost analysis or CGE modelling) no doubt account in part for both its considerable incidence and greater utilisation in developing countries. But the generally higher level of trade barriers in developing countries and greater impetus for unilateral trade policy reform in these countries is no doubt also a further contributory factor. Certainly there was an explosion of studies on developing countries following the major multi-country analyses of Krueger (1978) and Balassa *et al*. (1982), and through to the major post-liberalisation appraisals of for example Papageorgiou *et al*. (1991).

The proliferation of applied general equilibrium modelling, aided by improved hardware/software capabilities and efforts to enhance the quantity and quality of data

availability for social accounting matrix construction, has not however eliminated interest in and application of effective protection analysis. Policy makers and analysts frequently remain interested in levels of product or process disaggregation well below those that are tractable even for sophisticated CGE models. Although the substantial reduction of tariff barriers in industrialised countries has reduced the need and scope for quantifying trade barriers in these countries, alternative incentives and pressures for detailed analysis of trade barriers have emerged. In the case of both the industrialised and developing countries there is a renewal of interest in the role of 'natural' barriers (e.g. international transport costs) in influencing relative incentives. While for the developing countries trade policy changes are now being driven also by the explosion of regional and bilateral trade agreements. As a result, comprehensive estimates of effective protection continue to be reported for example in recent WTO *Trade Policy Reviews*; for example those for Bangladesh (2000) and Papua New Guinea (1999). Indeed for most developing countries the TPRs report as a minimum, the pattern of tariff escalation by stage of processing in each sector. It is more likely to be data availability or information on the technological characteristics of production or a lack of human resources to generate estimates that deters reporting of effective rates, than the emergence of a set of applied trade economists anxious about the theoretical critique of the concept.

Some evidence on effective protection rates for developing countries

Most analyses of effective protection report evidence in one of three (not necessarily mutually exclusive) ways: to facilitate either inter- and intra- sectoral comparisons, (single country studies); cross country comparisons; and inter-temporal comparisons. The last two are much less common than the first, given their greater resource demands and need for methodological consistency. We discuss examples of each.

Table 1 sets out some cross-country evidence from the Krueger *et al*. (1981) study. It contains inter-temporal evidence for two of the countries, but in general information has been used to make assessments or comparisons of the overall protectiveness of national trade policy regimes, through comparisons of average rates of effective protection to manufacturing industries in this case, and of the potential degree of distortion as indicated

[3] There is also an array of studies of OECD countries. See for example, Grubel and Johnson (1971), Barker and Han (1971), Greenaway (1988), Salvatore (1992).

by the range of EPRs. In these terms it was widely viewed that Korea at that time (1969) had a much less protectionist trade policy regime than countries like Pakistan and Uruguay. Similarly the overall, actual or potential, distortionary influences of trade policy were viewed as being greater, (because of the greater spread of effective rates), in Chile than Colombia in a South American context, or in Indonesia than Korea in a South East Asian setting. The expectation of the 'intelligent policy analyst', conscious of the danger of inferring precise sectoral resource allocation effects from a range of EPR industry rates, was not that reducing the spread of rates would unequivocally bring about a contraction of the highest and expansion of lowest rate sectors. It was rather that the overall degree of misallocation was likely to be reduced by increasing the uniformity of input and output tariffs and reducing the range of rates. On average, the incentive to produce in the importables manufacturing sector would be reduced through tariff liberalisation, and on average resources would tend to be reallocated within the importables manufacturing sector from more highly to less highly protected industries.

In similar fashion where there is inter-temporal evidence on the average rate and the spread of EPRs, which has been generated by a consistent methodology, we can make similar, *ex-post* assessments. In Table 1 the fall in the average and spread of EPR rates in Brazil between 1958 and 1967 is capturing the effects of trade policy reforms that tended to increase exportables production and reduce resource misallocation (and consumption distortions) within the importables sector. In the case of Bangladesh we show in Table 2 a run of annual (partial equilibrium) estimates of the average sectoral EPR (across 40 sectors) and the spread (measured by the standard deviation) for the period 1992/3 to 1999/2000. Whether or not input substitution and factor price effects introduce error into the estimation, it is improbable that the known trade policy reforms aimed at liberalising trade in Bangladesh have not (as indicated by the mean and variance of the partial equilibrium effective protection rates reported) reduced overall resource misallocation, and shifted resources in general from more highly to less highly protected sectors.

Of course the dangers of drawing incorrect inferences about general equilibrium, inter- and intra-sector effects or resource pulls, in the presence of incorrectly measured input substitution effects and ignorance of supply elasticities, are likely to be reduced when summary inter-country and inter-temporal comparisons are made (as in Tables 1 and 2). A very large number of studies have reported more detailed estimates of effective protection

at or below the sectoral level. In Tables 3 and 4 we illustrate this for Burundi and Cameroon respectively. But even in this form we do not need to subject the information to the test proposed in the theoretical critique of effective protection, namely to investigate the *precise* relationship between the ranking of firm level estimates and the extent to which resources have been pulled into specific sectors or subsectors. Indeed this has not been the practice adopted by intelligent policy analysts, concerned to illustrate general policy and resource allocation issues with numbers attached. Reporting only nominal input and output protection rates in this case may well obscure the differential implicit subsidisation and taxing effects of trade policy measures, the potential inconsistencies and variable costliness of protection, the broad and systematic biases on the trade policy regime and cases where social costs of protection are likely to be very high.

Among the important benefits of using the effective protection concept is an improved understanding of how trade barriers can simultaneously implicitly tax and subsidise local production, and how the net impact of these effects depends on the structure of nominal input and output protection and, in the absence of uniform protection, on the importance of tradeable inputs in production in a specific activity. The ability to demonstrate that a given structure of nominal rates and given level of tariff escalation can induce marked variations in net price effects across and within sectors has real value for policy purposes. As does the ability to demonstrate that uniform nominal input and output protection does not result in zero net price effects. By numerically summarising the effects of the nominal structure of protection and the technology structure on net prices, it is possible to challenge policy makers to consider whether the levels and variability of effective protection were planned or intended. By highlighting potential inconsistencies or unintended effects, for example where tariff escalation in the presence of very low value-added per unit of production or where high nominal protection of one producer tends to disprotect other producers for which the protected product is an important input, one is able to provide a framework or basis for policy reform. In the case of Burundi for example (Table 3), did policy makers really intend that trade policy should both raise and lower the net price of products in the "leather and footwear" sector, or that the increase in net prices should range from about 40% to nearly 7900% in "wood and paper products"? Without having to make precise predictions about the nature of the resource pulls induced by these rates, one would probably not be far out in concluding that there was considerable scope for allocation distortions both within and between sectors. And even if the net price distortions are in fact

translated into some uncertain mixture of resource allocation and factor income effects, the summary measures do offer a guide to potential sources of resistance to policy reforms, namely from specific factors in high effective protection activities.[4]

Implicit in the way partial equilibrium measures like those reported in Tables 3 and 4 were interpreted, was the view that there was a high probability of a direct relationship between the structure and costs of protection. Potentially infinitely high protection reported in many sectors in both of our examples was the outcome of seeking to induce import-substitution where local value-added was negatively valued at world prices. Drawing the policy-maker's attention to the difference in (private or social) profitability of activities as measured behind tariff barriers, with what might be expected in the absence of those barriers is a useful exercise. In just the same way, the present examples (like those produced by many others) can be used to point to the way that import substitution measures in manufacturing and tariff escalation are likely produce systematic biases that can also be viewed as the wider costs of protection. In Table 3 there is clear evidence of anti-agricultural bias, and in Table 4 of a systematic anti-export bias in each and every sector.[5] It is hard to believe that fewer resources were devoted to export production in 1986 in Cameroon than there would be with free trade. With the benefit of hindsight and experience of analysing effective protection rates and specific trade policy regimes, one may be quite comfortable in drawing inferences without representing the structure of protection and technology in a single summary measure of net price change, but our own experience is that policy appraisal is more likely to influence policy makers and the design of trade policy reform when supported by data - including estimates of effective protection.

4. Effective Protection and Trade Policy Reform

In negotiating on trade policy reform, policy-makers are invariably anxious to know what will happen to production, employment and incomes in specific industries (and firms). It is obviously tempting to use specific numbers on effective rates of protection within and across industries to predict the adjustment effects of trade reforms on variables such as

[4] It is this aspect of effective protection which Anderson (1998) is keen to rehabilitate in his 'new' measure, as we shall see later.

production (and in turn employment), in order either to micro-design adjustment support measures or to allocate compensatory incentives on political economy grounds. But in general this is not how estimates of effective protection (including comparisons of actual, pre-reform rates with hypothetical, post-reform rates) have been used. It has rather been a case of identifying the probabilities or effects on average that may be expected from reforms which push the regime to greater uniformity by reducing the average level and spread of effective rates of protection. In turn, this helps eliminate or reduce systematic biases in the trade regime; with production falls likely to happen on average in the sectors experiencing declines in effective protection as a result of policy reform and expansion of those sectors (including export-oriented industries) for whom effective protection increases post-reform. The reason for such caution follows in part because the theoretical critique of the concept, but only in part. There are in practice a range of measurement and operational issues – including imperfect substitutability between imported and local products, other sources of tariff redundancy, the measurement of tariffs in the presence of multiple border taxes and exemptions, estimation of the tariff-equivalence of non-tariff barriers, the treatment of non-tradeable inputs, the allocation of intermediate inputs to multiple outputs, and adjustment for exchange rate misalignment – that should make one cautious as to the precision of the estimated rates.

The critical and careful use of effective protection estimates allows the policy analyst to illustrate some of the 'first principles' for policy reform deriving from the concept (and set out above in section 2). Import tariffs have both taxing and subsidy effects, and the incidence of these effects is different for import-substitution and export activities. The reduction of tariff escalation will reduce the spread of effective rates of protection. A uniform pattern of tariff escalation will result in differential effective rates of protection between low and high value-added activities. Uniform input and output tariffs eliminates effective protection differentials, but results in positive effective protection for importables (except in the free trade case). These principles can be illustrated by simulating the effects of alternative (hypothetical) policy reform packages on the pattern of estimated (post-reform) rates. The concept and the numbers can be used to educate and to challenge the policy-maker to consider how trade policy reforms can reduce:

[5] Such biases are not unique to developing countries, for example, Greenaway (1988) reports negative effective protection for 40 out of 99 sectors analysed in the UK in 1979.

- overall or average protectiveness of the trade policy regime
- overall degree of distortiveness or variability of protectiveness of the regime
- any systematic biases against specific activities (e.g. exports, agricultural or intermediate goods production)

Of course in the case of 'first-best' reforms, i.e. total liberalisation, the exercise is trivial; all effective rates are zero post-reform! But where reform is subject to constraints, e.g. political economy or fiscal, then the policy-maker may well seek guidance on the effects of 'second-best' partial or graduated reforms.

Design of partial trade liberalisations

The effective protection concept and estimates of effective protection rates have in fact been central to the design of partial (unilateral) trade liberalisations that have been so common in developing countries over the last twenty-five years. Although there have been some recurring features of these reform programmes, it is evident also that differences in national circumstances and constraints have fashioned the content and timing of reforms. For some, reduction of the overall protectiveness of the regime has resulted in greater emphasis being placed on lowering nominal output protection, in others where for instance fiscal dependence on trade taxes is important, the raising of input tariffs (actual or operative through reduced exemptions) has been a more important influence on the reduction of average effective protection. A recurring feature has however been the attempt to increase the transparency and simplicity of the tariff structure. This has included measures to reduce the number and range of actual tariff rates that can be applied, and to reduce the use of discretionary exemptions. There are no doubt other motivations for these design features (e.g. reducing uncertainty and rent-seeking), but the implications of variable tariff escalation for the variability of effective protection (and therefore the overall distortiveness of the regime) were also very important considerations.

As argued earlier, those employing estimates of effective protection were in effect seeking to make policy-makers think in general equilibrium terms about the effects of trade policy and trade policy reforms. Over time the lowering of effective rates of protection for importables could be demonstrated to be lowering the disincentive to produce for export markets, i.e. to be reducing anti-export bias. This can be illustrated by comparing relative

rates of effective protection pre- and post reform in importable and exportable activities. In the shorter term however the effective protection concept was helpful in demonstrating linkage effects. Raising input tariffs will lower effective protection for importables, but also for exportables (in the absence of some form of exemption). Alternatively a tariff on importable output may simultaneously serve as an input tariff for exportables production. In this respect the effective protection concept has been central to the design of compensatory export promotion measures, in a world of partially liberalised imports. Many developing countries have introduced or strengthened their compensatory export measures as part of their trade reform programmes, using some combination of input tariff exemption (including Export Processing Zone status) and duty drawback facility.

The intelligent use and application of the effective protection concept has not, however, been to the exclusion of other tools of trade policy analysis. Information on nominal protection information is invariably reported alongside effective protection estimates. Similarly practitioners often use other tools such as domestic resource cost ratios to comment on the costs of protection. The present authors have also estimated true protection rates (Greenaway and Milner, 1987) in order to explicitly capture the broad patterns of relative price adjustments associated with trade policies and trade reform. This can again be viewed as in part a response to the theoretical critique but should also be viewed often as a matter of necessity in practice. The data demands of the tools of trade policy analysis (including effective protection) are considerable, and often beyond what is readily available in a developing country context.

The data and other demands of computable general equilibrium modelling are greater still. Even where CGE modelling is feasible and is used, the analysis is invariably at a much more aggregate level than that for the traditional partial equilibrium tools. Indeed, at the typical levels of aggregation used, CGE modelling obscures much of the detailed trade policy characteristics which are of interest and central to policy design and trade negotiations.

5. Why Have Effective Protection Estimates Been So Widely Used?

The last 25 years of the twentieth century was a period of pervasive trade policy reform: multilateral, minilateral and unilateral. The major international organisations were intimately involved with the first and the third. Multilateral liberalisation would not have been possible without GATT/WTO; it is doubtful if unilateral trade reforms would have been as pervasive without the involvement of the World Bank (and to a far lesser degree, the IMF). The WTO now publishes regular *Trade Policy Reviews* which are country specific. In many, effective rates are included, where there is evidence to report. In the absence of such evidence, data on tariff escalation is invariably included. The World Bank routinely prepares (pre-and post-SAL) reports on trade policy. There is no fixed template or metric used, but, as we have seen, over the years effective protection has been deployed and reported more extensively than any other single measure/indicator. Finally, as we saw in the previous section, academic analysts continue to calculate effective rates, both for OECD and developing countries. Despite the theoretical critique it has had an enormous impact on the activities of the academic profession, but even more significantly on policy and practice.

There are several factors behind the durability and acceptability of the concept. First, although it is clearly not a general equilibrium concept, it does actually force policy makers and analysts to think in general equilibrium terms. By driving them away from focussing solely on tariffs on final goods, it forces them to think about second order effects associated with the tariff structure as a whole. In so doing, it not only gives a degree of precision to an obvious intuition, it captures a feature of the real world which the policy making community and indeed the business community is acutely aware of. In every GATT Round since the Kennedy Round, negotiations on tariff escalation and harmonization have been prominent. In fact, some Government submissions have even included explicit proposals on effective protection, as in the Australian submission in the Uruguay Round.

Second, it is a relatively simple measure to understand. As a single indicator of protection to value added it conveys more information than nominal tariffs and potentially more meaningful information than simulated 'estimates' of production (and other variable changes) from CGE models. Moreover, that summary number can be a powerful tool in

highlighting how high the costs of significant departures from uniformity can potentially be. Third, even if one is worried about inferences that relate to specific activities, it is a robust indicator in broad terms of relative protection across sectors – for example exportables and importables, agriculture and manufactures – which is often the appropriate unit of analysis.

The fourth reason is that, despite the theoretical shortcomings of the concept, most analysts still view it as a useful indicator of potential resource pulls because ultimately many would instinctively share the view set out in Corden (1985) that it is vital to "….. *distinguish the possible from the probable. In the absence of precise knowledge of the underlying production structure, all things are possible. But some things are more probable"* (p.145). Even the harshest of critics of the concept concede this: *"Even though the theoretical validity of ERP as an indicator of resource pull is somewhat less than was initially asserted or hoped for, it continues to be a nice way to summarise the information on the protection structure resulting from tariffs on inputs and outputs ……. if ERPs are used with some care …….. even their analytical use can be somewhat suggestive"* (Bhagwati and Srinivasan, 1983 p. 131).

6. Conclusions

The development and refinement of the effective protection concept has been one of Max Corden's major achievements. As a new tool for trade policy analysis it was quickly adopted, in part because it had a higher information content than nominal protection, in part because it helped analysts and policy makers to think more broadly about the economic effects of a given protective structure. But the concept has not been without its critics on the grounds that *"In general equilibrium, the usual definition corresponds to no economically interesting magnitude",* (Anderson, 1998, p21).

That theoretical critique is a powerful one. Moreover, technology has marched on and some argue that since resource movements can be simulated directly in CGE models, measurement of effective protection by conventional means is now redundant. Interestingly, Anderson (1998) has recently sought to rehabilitate effective protection in a

general equilibrium framework which can be made operational in a CGE framework. He defines *"... the effective rate of protection for sector j. (as)... the uniform tariff (on distorted goods) which is equivalent to the actual differentiated tariff structure in its effects on the rents to residual claimants in sector j... the new definition might be called the distributional effective rate of protection*", (P.22). Thought of in this way, it is clearly a close cousin of the original concept, especially as developed by Jones (1975). But the calibration exercise then conducted by Anderson shows the weakness as well as the strengths of the approach. On the one hand, one may feel more confident in discussing relative income pulls; on the other hand the 'point estimators' are subject to a range of well known criticisms. For purposes of policy appraisal/policy reform the key ones are the lack of econometric input to parameterisation and the very high levels of aggregation used and the fact that it is a black box technology. Thus, when counter-intuitive outputs are generated, it is not always obvious why. By contrast, with effective protection, we know where to look for the caveats.

CGE modelling is becoming more widely used in policy appraisal and clearly has the capacity to tell a fuller story than estimates of effective protection. But it is not always an option nor might it be applicable at an economically meaningful level of aggregation. In such circumstances it will be more useful to be approximately right than precisely wrong. For this reason, used judiciously, effective protection will continue to have a shelf life.

Table 1: Cross-Country Evidence on Effective Protection Rate (EPR) in Manufacturing

Country	Year	Average (%)	Range of EPRs (%)
Brazil	1958	108	17 → 510
Brazil	1963	184	60 → 687
Brazil	1967	63	4 → 252
Pakistan	1963/4	356	-6 → 595
Pakistan	1970/1	200	36 → 595
Korea	1968	-1	15 → 82
Uruguay	1965	384	17 → 1014
Colombia	1969	19	-8 → 140
Chile	1967	175	-23 → 1140
Indonesia	1971	119	-19 → 5400
Thailand	1973	27	-48 → 236
Tunisia	1972	250	1 → 737
Ivory Coast	1973	41	-25 → 278

Source: Krueger et al (1981)

Table 2: Inter-Temporal Evidence on Effective Protection in Bangladesh, 1992-2000

Year	Sectoral [(1)] Average ERP (%)	Standard Deviation
1992/3	75.7	83.3
1993/4	56.7	56.3
1994/5	40.6	30.8
1995/6	33.0	23.4
1996/7	32.4	26.4
1997/8	28.6	22.7
1998/9	26.8	20.6
1999/2000 [(2)]	24.5	19.7

[(1)] across 40 sectors
[(2)] provisional estimates

Source: WTO (2000), table IV.I

Table 3: Effective Protection By Sector: Burundi (1984)

Sector	Range of Rates %
Agricultural Products	-2 → 4
Food, drink and tobacco	86 → 2017
Leather and footwear	-4 → 102
Textiles	12 → 124
Wood and paper products	43 → 7896
Metal products	16 → ∞
Chemicals	9 → ∞
Pharmaceuticals	1 → ∞
Construction goods	63 → 72

Source: Greenaway and Milner (1991)

Table 4: Intra and Inter- Sectoral [2] Evidence on Effective Protection: Cameroon (1986)

Sector	Range of EPR rates: -	
	Domestic Sales	Export Sales
Forestry	331 → ∞	-39 → -15
Wood and Paper Products	139 →463	-17 → -15
Agriculture & Fisheries	72 →410	-28 → -17
Agro Industry	58 → ∞	
Textiles	7140 → ∞	-22 → -11
Leather & Rubber	337 → ∞	-45 → -12
Chemicals & Pharmaceuticals	114 → ∞	-23 → -12
Metal Products	182 → ∞	-37 → -12
Engineering	all ∞	-73 → -17
Construction	both ∞	

[1] firm level estimates
[2] ∞ denotes potentially infinitely high protection in the presence of negative value-added at world prices

Source: Milner (1990)

Bibliography

Anderson, J. (1988) 'Effective Protection Redux', *Journal of International Economics*, Vol. 44, pp. 21-44.

Balassa, B. (ed) (1982) *Development Strategies in Semi-Industrialized Economics* (Baltimore, John Hopkins).

Bhagwati, J. and Srinivasan, T.N. (1973) 'The General Equilibrium Theory of Effective Protection and Resource Allocation' *Journal of International Economics*, Vol. 3, pp.

Bhagwati, J. and Srinivasan, T.N. (1983) *Lectures on International Trade* (Cambridge MA, MIT Press).

Bruno, M. (1973) 'Protection and Tariff Change Under General Equilibrium' *Journal of International Economics*, Vol. 3, pp.205-225.

Corden, W.M. (1966) 'The Structure of a Tariff System and the Effective Protection Rate', *Journal of Political Economy*, Vol. 74, pp. 221-237.

Corden, W.M.(1969) 'Effective Protection Rates in the General Equilibrium Model: A Geometric Note', *Oxford Economic Papers*, Vol. 21, pp. 135-141.

Corden, W.M. (1971a) 'The Substitution Problem in the Theory of Effective Protection', *Journal of International Economics*, Vol. 1, pp. 37-57.

Corden, W.M. (1971b) *The Theory of Protection* (Oxford, Oxford University Press).

Corden, W.M. (1985) 'Effective Protection Revisited' in W.M. Corden, *Protection, Growth and Trade* (Oxford, Blackwell).

Ethier, W.J. (1971) 'General Equilibrium and the Concept of Effective Protection' in H.G. Grubel and H.J. Johnson (eds) *Effective Tariff Protection*, (Geneva, GATT).

Ethier, W.J. (1972) 'Input Substitution and the Concept of the Effective Rate of Protection', *Journal of Political Economy*, Vol. 80, pp. 34-47.

Ethier, W.J. (1977) 'The Theory of Effective Protection in General Equilibrium: Effective Rate Analogues of Nominal Rates', *Canadian Journal of Economics*, Vol. 10, pp. 233-245.

Greenaway, D. (1988) 'Effective Protection in the United Kingdom', *Oxford Bulletin of Economics and Statistics*, Vol. 50, pp. 313-324.

Greenaway, D. and Milner, C.R. (1987) 'True Protection Concepts and the Evaluation of Trade and Industrial Policies in Developing Countries', *Journal of Development Studies*, 23, 200-19.

Greenaway, D. and Milner, C.R. (1991) "Policy Appraisals and the Structure of Protection in a Low-income LDC: a Case Study of Burundi" *Journal of Development Studies*, 27, 22-42.

Greenaway, D. and Milner, C.R. (1993) *Trade and Industrial Policy in Developing Countries* (London, Macmillan).

Khang, C. (1973) 'Factor Substitution in the Theory of Effective Protection: A General Equilibrium Analysis', *Journal of International Economics*, Vol. 3, pp.227-244.

Krueger, A.O. (1978) *Liberalisation Attempts and Consequences* (New York, National Bureau of Economic Research).

Krueger, A.O. (1997) 'Trade Policy and Economic Development: How we Learn', *American Economic Review*, Vol. 87, pp.1-22.

Jones, R. (1975) 'Income Distribution and Effective Protection in a Multicountry Trade Model', *Journal of Economic Theory*, Vol. 11, pp. 1-15.

Jones, R.W. (1971) 'Effective Protection and Substitution', *Journal of International Economics*, Vol. 1, pp. 59-82.

Milner, C.R. (1990) 'Identifying and Quantifying Anti-export Bias: the Case of Cameroon', *Weltwirtschafliches Archiv*, 126, 142-55.

Papageorgiou, A., Michaely, M. and Choksi (eds) (1991) *Liberalising Foreign Trade* (Oxford, Blackwell).

Ray, A. (1973) 'Non-traded Inputs and Effective Protection: A General Equilibrium Analysis', *Journal of International Economics*, Vol. 3, pp. 245-258.

Salvatore, D. (ed) (1992) *National Trade Policies*, (Amsterdam, North Holland).

WTO (2000) Trade Policy Review, *Bangladesh*, Geneva, WTO.