ESSAYS ON TRADE POLICY AND PARETO GAINS FROM TRADE

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Abstract

It is a dearly held conviction among economists that free trade is beneficial. On the other hand, we see considerable popular opposition to trade liberalization. Given that some individuals can lose even in the presence of aggregate gains, their opposition is understandable. However, it threatens further trade liberalization and might even provoke a backlash against what has already been achieved. Thus, it seems desirable to seek Pareto gains where, by definition, nobody is harmed.

The issue is taken up at a theoretical level in the literature which I review in a first paper. In order for trade liberalization to be Pareto improving, the reform must generally be accompanied by redistribution. Using using lump sum transfers or Diamond-Mirrlees commodity taxation as alternative means of redistribution, Pareto gains from trade can be established in static general equilibrium models. This result can be generalized for customs unions and also applies to migration.

A second paper (joint work with Giovanni Facchini) extends this literature by showing that a special duty free zone also leads to Pareto gains. Our duty free zone involves an entry fee exempting agents from commodity taxation. It can be viewed as a special case of non-linear taxation. Furthermore, we prove that such a regime dominates free trade with commodity taxation because the duty free zone is an efficient way of distributing the surplus from such a tax scheme.

A third paper goes beyond the static literature by adding a second period. In a general equilibrium model with a continuum of heterogeneous agents, if agents anticipate government redistribution after the reform, their strategic reactions may render Pareto gains unachievable. Hence the long-standing Pareto gains from trade result needs qualifying in general dynamic models. This is a typical problem of

strategic under-investment, which can be overcome by subsidizing capital acquisition in addition to carrying out redistribution.

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Chapter 1

Introduction

Over the last half-century our world has experienced a process of cultural and economic integration that has come to be know as globalization. The international exchange of ideas, goods, and people has multiplied. Many of us would not want to live without the diversity, the opportunities, and the economic prosperity this development has brought us. Others feel intimidated by the foreign influence and fear to be left behind in an accelerating world economy. While the majority of the economics profession is probably among the most ardent supporters of globalization, it is nevertheless our job to investigate and understand the economic reasons lying behind people's opposition. One reason behind this widespread opposition is the possibility that an unfortunate few might lose in the process of globalization even if there are aggregate gains. Just think of all those sectors in developed countries that have disappeared over the years and the people who once worked in them. Their opposition could have been rational if they were unable to find comparable jobs when their skills became obsolete. We investigate whether such individual losses can be avoided and whether it is possible for everyone to profit from globalization. We not only discuss policies to achieve such Pareto gains — as gains to everyone are known to economists — but also possible obstacles that might prevent us from obtaining them. Finding ways out of the implicit distribution–efficiency trade-off seems well worth our effort if we believe in the desirability of both equality *and* gains from trade. Our goal here is to investigate the possibility of gains from opening up the economy without at

the same time jeopardizing the process by provoking opposition through increased inequality. Or, viewed from the other side of the trade-off, how can equality be maintained without foregoing the gains from trade?

This is the issue addressed in the Pareto gains from trade literature which we review in chapter 2. The starting point for this literature is the above-mentioned insight that some people might lose even in the presence of aggregate gains. The crucial question then becomes whether these gains can be redistributed to achieve gains for everyone. Using distortion-free lump sum transfers, this is indeed the case. Lump-sum redistribution, however, is not incentive-compatible because people can exploit the system by mis-stating private information in a way that exaggerates the true amount of compensation they would need. Pareto gains from trade can also be established involving only commodity taxation. These taxes (and subsidies) have to be chosen carefully to freeze consumer prices at their autarky level, thus keeping consumers as well off as before, while achieving efficiency gains on the production side by exposing it to free trade at world market prices. These efficiency gains lead to a budget surplus that can be used to make consumers strictly better off. Though appealing, the tax system required is prohibitively complex and, in addition, the approach is suboptimal because it does not realize potential gains on the (frozen) consumption side of the economy. Subsequent work has focused on extending this result to non-linear taxation. Although potentially second-best, non-linear taxes are even more complex and can be circumvented if resale is possible. On the other hand, they entail duty free zones as an interesting and simple special case. This is the topic of chapter 3 to be outlined below. Given the real-world importance of income taxation as a redistributive instrument, it is somewhat surprising that it has played little to no role in the Pareto gains from trade literature. The reason is the lack any presumption that progressive income taxation would be sufficient to guarantee Pareto gains. Extending the analysis to include a time dimension equally casts doubt on the feasibility of Pareto gains as we will discuss in Chapter 4. Other extensions that will be discussed in our review of the literature are the inclusion of increasing returns to scale, the generalization to customs unions, and the issue of migration.

In chapter 3, joint work with Giovanni Facchini[1] and published as Facchini and Willmann (1999) in the Journal of International Economics, we discuss the gains from duty-free zones, a special case of non-linear taxation. While the existing literature analyzes general non-linear taxation in rather simple models — limited to two goods and consumers who differ only in their endowments — our contribution goes in the opposite direction. We consider a regime with (linear) commodity taxation for those staying outside the duty-free zone and an entrance fee for those who want to enter — a simple case of non-linear taxation. Using the dual approach in a rather general model, we show that the introduction of such a duty-free zone leads to Pareto gains over autarky. Our regime differs from the conventional notion of a duty-free zone in that the production side of the economy is exposed to the world market as it would be under free trade. When comparing it to free trade, our regime is Pareto inferior to free trade with lump-sum redistribution because part of the consumption side — that part not entering the duty-free zone — is still frozen. On the other hand, it Pareto dominates trade with commodity taxation and frozen consumer prices. The underlying reason for this result is that the potential winners from trade liberalization can opt out of the tax scheme, pay the entrance fee to make up for lost tax revenue, and realize gains from trading at world market prices. Our result is all the more remarkable as it does not require any additional information to improve upon free trade with commodity taxation.

In chapter 4 we generalize the usual Pareto gains from trade literature by adding an explicit time dimension. Once one acknowledges the dynamic nature of trade liberalization, the question becomes whether anticipated redistribution in the wake of the reform leads to strategic behavior on part of the agents beforehand. If people expect to be compensated for losses or to contribute towards payments after trade liberalization, will this influence how well they prepare for the liberalized economy? And if it does, could this strategic behavior potentially sabotage the gains from trade? The issue at stake is the time consistency, or rather subgame perfection, of the policy mix. To address this issue formally, we set up a two-stage general equilibrium model

[1] My friend and fellow graduate student Giovanni and I researched and wrote this paper together, inspired by earlier work I had done on the topic for Peter Hammond.

with a continuum of heterogeneous agents who differ in their abilities to acquire skills. We solve the model for the autarky case as a reference point and then compare it to free trade without redistribution to highlight the distributional consequences of trade liberalization. Before addressing the strategic effect, we verify that Pareto gains are possible if the strategic affect is absent by assuming that the government only redistributes in the first period and credibly commits to remain inactive thereafter. If, on the other hand, the government is free to use lump-sum redistribution in the second period, then there exists a critical level of the gains from trade below which the strategic effect dominates and Pareto gains are impossible. In response to this negative result, we discuss possible remedies. We show how ability-dependent subsidies and taxes on human capital acquisition in the first period can be used to avoid the strategic effect and achieve Pareto gains from trade. This solution depends on the government's knowledge of individual agents' abilities. If these are private information, we show that freezing consumer prices and exposing the production side to the world market also leads to Pareto gains from trade. The latter scheme is dominated by the first solution, however, when agents' abilities are observable and can be used to determine taxes and subsidies.

Chapter 2

Pareto-gains from Trade: A Survey

Abstract

This paper reviews the literature on Pareto gains from trade. The different impact of trade on heterogenous agents requires us to consider redistribution in order to achieve gains for everyone. We present the Pareto gains from trade result using both lump-sum transfers as well as commodity taxation. Newer work involving non-linear taxation, the special case of a duty-free zone, and income taxation will also be discussed. Subsequently, we address the closely related topic of Pareto gains from customs unions and offer a brief note on migration. Final remarks conclude the paper.

2.1 Introduction

It is a dearly held conviction among economists that trade is beneficial. The idea is probably as old as economics itself[1] and constitutes the *raison d'être* for the field of international economics. The line of argument normally given is that efficiency gains from specialization expand national consumption sets and that this should increase welfare. Public opinion is usually not convinced and we often see considerable opposition to trade liberalization. One possible explanation for this somewhat surprising contrast is the possibility that an unfortunate few might lose even in the presence of aggregate gains. This insight is important not only if we are concerned about social

[1] Cf. Smith (1776, p. 413) and Ricardo (1817, chapter VII).

inequality but also if we consider its political economy implications. Since gains — from lower import tariffs for example — tend to be spread widely while losses are often concentrated in a specific sector, losers find it easier and more worthwhile to overcome the free-rider problem and lobby politicians to satisfy their special interests by restricting trade. To prevent the resulting political opposition to trade, one should consider redistributing the gains in such a way as to avoid losses and ensure the political acceptability of the reform. This is the approach taken in the Pareto gains from trade literature which we will review in this paper.

The starting point for this literature is Viner's (1937) account of the above-mentioned fact that some people can lose even though there are aggregate gains from trade. Kemp (1962) and Samuelson (1962) show graphically how lump-sum redistribution of these aggregate gains leads to Pareto gains from trade. A decade later, Grandmont and McFadden (1972), Chipman and Moore (1972), and Kemp and Wan (1972) establish this result formally. Lump-sum redistribution, however — though theoretically appealing because it is distortion-free — suffers from incentive-incompatibility[2] and is hardly relevant for practical purposes. In light of this shortcoming, Dixit and Norman (1980) establish Pareto gains from trade involving only ad valorem taxes and subsidies. Their taxation scheme freezes consumer prices at their autarky level while achieving production efficiency by exposing the production side of the economy to free trade in the spirit of Diamond and Mirrlees (1971). Kemp and Wan (1986) rightly criticize the resulting allocation as not even second-best. Subsequent work by Feenstra and Lewis (1991, 1994) on non-linear taxation can be regarded as addressing this criticism. Although set in a simpler framework because the problem is more complex, Feenstra and Lewis show how Pareto gains from trade can be achieved by means of a non-linear tax. In addition, they point out that a certain type of duty-free zone can be regarded as a special case of non-linear taxation. In Facchini and Willmann (1999) we take up this idea and establish Pareto gains from this kind of duty-free zone. We also show that such a regime dominates free trade

[2]See Hammond (1979) and for this context also Hammond and Sempere (1995).

à la Dixit and Norman. Given the real-world importance of income taxation,[3] Spector (1999) addresses the question whether Pareto gains from trade can be achieved using this instrument. But even in his simple model this is not necessarily the case. In Willmann (2000) we also cast doubt on Pareto gains from trade due to strategic under-investment in a dynamic context. Work by Krugman (1981) in the context of increasing returns points the other way: more scope for gains from trade alleviates the redistribution problem.

Related to the Pareto gains from trade literature are the issues of gains from customs unions and migration. A customs union can be viewed as a generalization of worldwide free trade because when the set of countries remaining outside the union is empty we are back at free trade. Kemp and Wan (1976) circumvent the well-known ambiguity of trade-diversion and trade-creation by assuming that the union maintains its trade vector with the rest of the world constant. Under this scenario they are able to establish Pareto gains from customs unions.

Factor mobility falls well within the scope of the general equilibrium models which form the basis of the Pareto gains from trade literature. Migration, however, is not simply trade in labor services but involves relocation of the factor's owners which raises further questions.

The outline of the paper is as follows. In section 2.2, we discuss the gains from trade and its distributional implications. Since this is the main focus of the paper the section will be divided into several subsections to be outlined below. Subsequently, in section 2.3, we address the gains from customs unions. Section 2.4 contains a note on migration and, in section 2.5, we offer concluding remarks.

2.2 Pareto gains from trade

In this section we address the main subject of our paper, the possibility of Pareto gains from trade. Before turning to the distributional implications of trade, subsection 2.2.1 reviews the traditional argument for aggregate gains in the representative consumer case. In subsection 2.2.2, we introduce heterogeneous agents and discuss the resulting

[3]This includes negative income taxation, i.e. income subsidies, for low incomes.

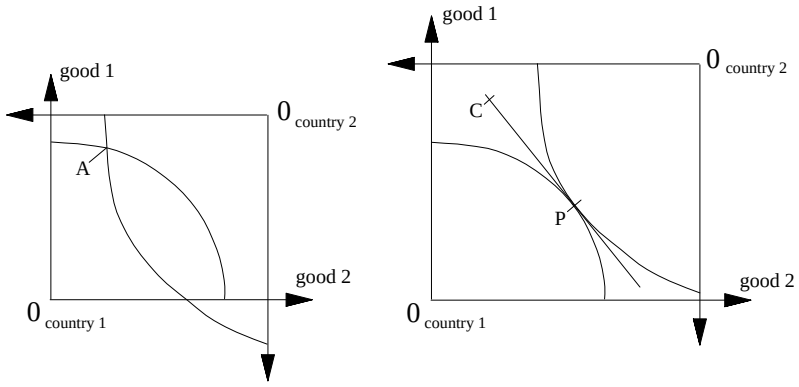

Figure 2.1: Gains from trade

distributional problem. Subsection 2.2.3 presents the standard Pareto gains from trade result using lump-sum redistribution and, in subsection 2.2.4, we discuss the same result involving Dixit–Norman taxation. We then turn to non-linear taxation in subsection 2.2.5, emphasizing the special case of a duty-free zone. In subsection 2.2.6, we consider income taxation and then, in subsection 2.2.7, discuss the "small country" assumption. In subsection 2.2.8, we extend the discussion to increasing returns to scale and dynamic models. Subsection 2.2.9, finally, offers some general remarks.

2.2.1 The representative consumer case

Let us first review the traditional argument for aggregate gains from trade when there is only one (representative) consumer or when the country in question is a centrally planned command economy. The simple 2×2 (two final goods and two countries) case can be analyzed graphically.

The left part of figure 2.1 shows two countries in autarky. Both produce and consume at point A on their respective production-possibility frontiers.[4] The right part of figure 2.1 shows the free trade situation. Both countries now produce at point P where the marginal rates of transformation are equal and production is therefore

[4]The exact location of that point depends on demand conditions in both countries which are not depicted in the diagram.

efficient. The increased size of the rectangle reflects these efficiency gains. They trade along the line PC whose slope represents the terms of trade. The locus of their respective consumption point(s) C outside both countries' production-possibility frontiers indicates that these consumption bundles could not have been attained in autarky.[5]

The argument can easily be generalized to production economies with many goods and factors.[6] Initially, the autarkic consumption vector of the (representative) consumer, x_0, equals the autarkic production vector of the economy, y_0.[7] In the new free trade equilibrium consumption can differ from domestic production by the quantities traded, $z_1 = x_1 - y_1$, or valued at the free trade price vector (p_1): $p_1 z_1 = p_1 y_1 - p_1 x_1$. The assumption of balanced trade then implies $p_1 z_1 = 0$. Furthermore, assuming that producers are profit maximizers, $p_1 y_1 \geq p_1 y_0$. This shows that the consumer's income which she can spend on consumption in the free trade situation ($p_1 x_1 = p_1 y_1$) is sufficient to effectuate the old net trades at new prices, since $p_1 y_1 \geq p_1 x_0$ remembering that $x_0 = y_0$ and therefore $p_1 x_0 = p_1 y_0$. So the consumer can only benefit from free trade. The above inequality holds strictly, i.e. there are efficiency gains from free trade, if there are transformation possibilities so that y_1 can differ from y_0 and if free trade prices differ from autarkic prices because otherwise firms would not change production. But even if there is only equality so that $p_1 x_1 = p_1 x_0$ it is still possible that the consumer strictly prefers x_1.

2.2.2 Distributional considerations

The limitation to the case of only one (representative) consumer where distributional questions do not arise and the case of a centrally planned economy are unrealistic. The former existed only in Daniel Defoe's imagination and is biologically unstable while the latter — besides being outmoded — rarely survives trade liberalization. With many (different) consumers, however, trade will in general have an impact on income distribution. Already Viner (1937, page 531) points out that "The removal of duties

[5] The demand side of each national economy has again been hidden to keep the graphics simple.
[6] We assume constant returns to scale and sufficient conditions for existence.
[7] The subscripts 0 stand for autarky while 1 will denote the trade situation.

tends to alter the distribution of national money income unfavourably for the owners of the services entering relatively more heavily into the production of the hitherto protected commodities than into the production of the export commodities." In other words, losses might be experienced by individuals working in, owning, or managing uncompetitive industries that produce import substitutes. On the other hand, gains will be enjoyed by sectors whose products fetch higher prices on the world market than under autarky and by consumers who benefit from cheaper imports. While the emphasis is usually put on factor markets — just think of the Stolper–Samuelson result — the problem can also occur on the consumption side.

Given the different impact of free trade on heterogeneous agents, the ordering of alternative allocations is non-trivial. One way out is to use a social welfare function as do Chipman and Moore (1972), but we follow the majority of the literature in using Pareto comparisons. This is a strong criterion: in fact one can show that Pareto superiority is sufficient but not necessary for any Bergson–Samuelson type welfare function to increase. On the other hand it is not immune to ethical criticism. A society where a dictator consumes everything is Pareto efficient, but makes us feel uncomfortable. Related to the criterion's strength is its incompleteness when some agents gain and others lose. To overcome this problem, we have to consider redistribution — either real or potential — in order to achieve Pareto gains. The crucial question that will be addressed in the following subsections is whether trade accompanied by a suitable compensation scheme ensures gains to everybody.

2.2.3 Pareto gains with lump-sum transfers

Lump-sum redistribution is a familiar tool of welfare economics. Its advantage — no distortions — as well as its disadvantage — the information problem — are well known.[8] In the context of gains from trade, lump-sums can be used to compensate those who lose moving from autarky to trade by payments of those who gain. Lump-sums may be paid directly from one individual to another or indirectly via the

[8]Concerning the advantage cf. Musgrave and Musgrave (1980, p. 313); for the information problem see Hammond (1979).

government.[9] The question is whether total gains suffice to compensate all the losers — or equivalently, whether the government can administer such a scheme without running a deficit. Intuitively, the previous findings suggest an affirmative answer. Kemp and Wan (1972), Grandmont and McFadden (1972), and Chipman and Moore (1972) proved this more formally. The Pareto gains from trade theorem can be expressed in Kemp's (1993) words as follows:

> If some closed country s abandons all artificial obstacles to international trade, either in the whole set of potentially tradeable goods or in some proper subset, and if the preferences, technologies and endowments of the trading partners are suitably restricted then there is a scheme of lump-sum compensation in s and an associated competitive world equilibrium such that no individual in s is worse off than in autarky.

As in subsection 2.2.1, the new situation is actually strictly Pareto superior if it is not the case that the autarkic solution was — by chance — already the free trade equilibrium and if each consumer is locally non-satiated.[10] Kemp and Wan (1972) have extended the above result to the comparison of tariff-distorted trade with autarky and found that *fixed-tariff trade is potentially unharmful in relation to no trade.* Note that autarky is always the initial reference situation.

This theoretically important result is somewhat limited by the practical obstacles to implementing the necessary lump-sum scheme. Implementation would require the government to have complete information about individuals' net trades in autarky.[11] But this knowledge is private information. Indeed, perhaps even individuals themselves do not know exactly what they would have bought and supplied if autarky had persisted. Faced with a lump-sum scheme of the sort outlined above, losers but also gainers of liberalization would have every incentive to exaggerate their losses instead of revealing their true plans. Even an inventory at the end of autarky would not help, since there would be serious misrepresentation on that date in order to secure future gains. So incentive incompatibility represents an insurmountable problem for Pareto

[9] Given the irrelevance of this scheme in practice this question hardly matters.
[10] Cf. Grandmont and McFadden (1972).
[11] See Feenstra and Lewis (1991, p. 22).

improvements from free trade using lump-sum compensation. Unless one starts from a centrally planned economy as Lau, Qian, and Roland (1997) discuss for the Chinese case.

2.2.4 Dixit–Norman commodity taxation

Being aware of the findings that a lump-sum scheme is not truly feasible once incentive compatibility is required, Dixit and Norman[12] proposed a scheme relying only on taxes and subsidies on goods and factors. The idea is to guarantee consumers' autarkic utility by freezing the price vector which consumers face, while at the same time exposing the supply or production side of the economy to world prices for traded goods. Facing the same prices as under the status quo, rational consumers will take the same decisions as before and will stay in their anterior position with the same utility as before. Producers on the other hand will adjust to free trade prices and thereby realize efficiency gains.

The consumer price vector is held constant by *carefully chosen*[13] taxes and subsidies. The worker who would otherwise have lost from liberalization receives a subsidized wage afterwards. On the other hand, consumers who would have benefited from cheaper imports now have to pay a commodity tax or tariff — depending on whether it is levied on the imported or domestically produced variant of a tradeable commodity. More specifically, the tax vector t is chosen endogenously in such a way that the new consumer price vector p_1^c (including wages and dividends), which ex-definitione equals the new free trade price vector p_1 — faced only by producers and the outside world — plus tax, is equal to the old autarkic price vector (p_0): $p_1^c = p_1 + t = p_0$.

Dixit and Norman (1986) have shown that under such a scheme there is a free trade equilibrium where "all consumers are exactly as well off as under autarky" and the "government buys and throws away" the eventual surplus from efficiency gains. Again, there are actual gains if the free trade price vector differs from the autarkic one and if there are transformation possibilities. Throwing the gains away is, of

[12] Dixit and Norman (1980, pp. 79–80) and, replying to criticism from Kemp and Wan (1986), again Dixit and Norman (1986).

[13] An expression used by Kemp and Wan (1986) in their criticism.

course, rather an intermediate step of the theoretical argument than a serious policy proposition.[14] The government must somehow find a way to distribute these gains to consumers in order to actually make them better off instead of just keeping them at their old utility level. It could do so by distributing the gains in kind, or by lowering a tax or raising a subsidy. The lower tax (higher subsidy) only works if all or at least some consumers buy (sell) the relevant commodity while no consumer sells (buys) it. This is the so-called Weymark (1979) condition that will usually be fulfilled in a developed economy. Another way[15] is to distribute the gains by means of a poll subsidy — one equal lump sum for everybody, which obviously does not depend on private information.

The Pareto gains from trade theorem has been strengthened by this line of research but problems remain.[16] When implementing this scheme taxes need to be set to freeze prices. The bureaucracy and the information necessary to achieve this will at best be costly, at worst trial and error procedures will never end. In addition, prices would have changed in autarky, too, in the sense that for example improving quality of a product also raises its price or that an elderly worker who becomes less productive should earn less. Frozen prices should take account of this and be adjusted accordingly — certainly too much to ask for from a state official. Further problems arise in the case of black markets or when producer and consumer are the same person. Different producer and consumer prices could hardly be enforced in such cases.

Kemp and Wan (1986) stress another point: Is this second best solution really a best? Dixit and Norman (1986) admit that improvements are possible and argue that this actually strengthens their result. But sub-optimality might hinder political acceptability. This scope for improvement lies in the possibility that the distortion caused by the consumer price freeze might be unnecessarily large. In fact potential losers not only keep their old utility because of the price freeze, but eventually gain from the second stage distribution of the government surplus. The scheme that will

[14] Remember that unfortunately governments of developed countries really do so with agricultural surpluses from time to time.

[15] Taken by Hammond and Sempere (1995) who also prove that a new equilibrium exists after such measure has been taken.

[16] Cf. Hammond and Sempere (1995, p. 22).

be discussed next can be considered as stemming from this criticism.

2.2.5 Non-linear Commodity Taxation

Feenstra and Lewis (1991) discuss compensation in a very specific framework. But since their result is interesting and awaits generalization it will be presented here. They consider a two-good pure exchange economy where agents have the same specific utility function and varying endowments of one of the two goods which will be relevant to the discussion. In autarky some agents sell certain amounts of this good, while others buy, depending on their endowment. Feenstra and Lewis assume that trade liberalization lowers the price of this good, making large sellers of it worse off, while buyers and marginal sellers gain. They further assume that the government offers a menu of options consisting of pairs (T, x) — for a specific quantity x of the good which an agent might want to buy (or sell if x is negative) she has to pay a fee T (or receives it if T is negative). This is in fact a non-linear tax scheme.

The problem then consists of maximizing average utility subject to the constraint that no individual is made worse off and to the government's budget constraint. This is done by dynamic optimization using T and x as control variables. The solution to this optimization problem is a non-linear tax scheme with special characteristics.[17] Non-linear commodity taxation is, however, hardly more practical than the Dixit–Norman scheme: it even breaks down for exchangeable goods which individuals are able to resell among themselves.[18] But Feenstra and Lewis hint at an interesting variant of their scheme. This consists of a duty-free zone with an entrance fee where the government offers only two options: Either pay the entrance fee and trade at world market prices. Alternatively, avoid the fee and trade at the old autarky prices — now including a tax.

In Facchini and Willmann (1999) we take up this idea and analyze the welfare effects of such a regime in a general equilibrium framework. We show that the introduction of a duty-free zone accompanied by Dixit–Norman commodity taxation for the rest of the population leads to Pareto gains. We also show that our regime

[17] For details see Feenstra and Lewis (1991).
[18] See Hammond (1987).

Pareto dominates free trade with a Dixit and Norman compensation scheme, even though it does not require any additional information. Note that our regime — as does theirs — involves exposing the production side of the economy to free trade in order to achieve production efficiency. It can in fact be regarded as an extension of the Dixit–Norman scheme: Outside the duty-free zone consumer prices are frozen and consumers stay under the umbrella of Dixit–Norman commodity taxation. But now the government distributes the surplus by allowing agents who are willing to pay the entrance fee to opt out of the national tax scheme and trade at favorable (for them) world prices. So potential winners from free trade give up part of their gains by paying the lump-sum entrance fee in order to trade at undistorted world market prices. Of course, this fee has to be carefully chosen such that the government does not hand out more than its surplus.

Feenstra and Lewis (1991) also mention the case of labor markets. There the entrance fee of a "duty-free zone" would be negative. Workers would receive a fixed subsidy to leave protected industries where after-tax wages are frozen and work elsewhere at world market wages. This case awaits closer investigation.

2.2.6 Income taxation

The literature discussed so far focuses on a few redistributive instruments — lump-sum transfers, or linear and non-linear commodity taxation — that are either not realistic or not widely used to this end in practice. In most countries, it is income taxation which plays a substantial redistributive role due to its progressivity. The Pareto gains from trade literature has largely ignored this instrument probably because there is no reason to presume that redistribution via income taxation is sufficient to achieve Pareto gains. To see this consider two individuals who receive the same income after trade-liberalization. If their consumption bundles and factor supplies are not identical, it is most likely that trade affects both differently. But this difference cannot be addressed using income taxation because both have the same income.

Spector (1999) points out another obstacle. He considers a government that pursues redistributive objectives by means of income taxation and argues that this instrument works through two channels: direct redistribution, but also an additional effect on prices. The latter is most effective when the economy is closed and prices are completely endogenous, whereas it is hardly operational in small (or worse infinitesimal) open economies. In his model the government is able to exploit both channels to achieve its distributional goals under autarky, but is no longer able to manipulate prices once the infinitesimal country under consideration opens up to free trade. It is shown that trade liberalization does not necessarily increase welfare (as measured by a social welfare function) because income taxation becomes less effective due to the loss of its effect on prices. Decreasing social welfare implies that trade in this case is not Pareto improving. The (empirical) question here is to what extent income taxation really has price effects.

2.2.7 The small country case

Assuming that a country is small amounts to saying that the country is too small to influence the prices at which it trades.[19] Instead it acts as a price-taker on world markets accepting its terms of trade as given. This assumption is frequently used in international economics because it facilitates the analysis and allows to establish some further results. An important one is the following: It is possible to show for a small country that free trade is not only gainful when compared to autarky but also when compared to any form of restricted trade.[20] This result becomes plausible immediately if we approach it from a different perspective. Consider a large country which is in a position to influence world prices. Even if agents in that country behave as price-takers, the government can restrict trade by tariffs to secure monopoly rents. This is the case of optimal tariffs. Thus for a large country managed trade might be

[19] Grandmont and McFadden (1972) distinguish between infinitesimal, small, and large countries. The first two take world prices as given, but the small country influences the determination of a world equilibrium passively by its trade, whereas the infinitesimal country's trade is too small to do even that. The large country, on the other hand, treats world prices as variable. Here we will understand small as they define infinitesimal and their small (respectively large) case will be considered as the usual case of a country of any size without (respectively with) optimal tariffs.

[20] Cf. for example Dixit (1985).

even better than free trade. But the small country is deprived of this possibility by assumption. Tariffs would only cause distortions in its domestic economy without an advantageous change in its terms of trade.

Another result which relies on the small country assumption concerns the question whether, when there already is free trade in some commodities, extending trade to extra commodities is welfare increasing.[21] Over all countries it certainly is, because production becomes more efficient. But a single country might lose, if opening of trade in an additional commodity leads to a deterioration of its terms of trade. Now a small country cannot change its terms of trade. Thus it can be sure to gain from allowing trade in an extra commodity. This is a relevant question, for example, when there already exists free trade in goods and one considers freeing trade in factors like capital or labor — i.e., migration.

Finally, the reader might note that whenever the small country assumption becomes necessary it usually indicates that the same result cannot (yet) be shown for countries of any size. Since the assumption is not realistic for countries that are usually of interest, it therefore shows where the limits of the analysis lie.

2.2.8 Extensions

The work reviewed so far has been developed within a largely static, neoclassical framework. In this subsection we consider two possible extensions: increasing returns to scale and dynamic models. First we explore what can be said about the distributional implications of trade liberalization in the presence of economies of scale. The rich variety of models constituting the so-called new trade literature is at the same time a source of excitement and of disillusion. On the one hand, we have better tools to understand how market structure and international trade interact; on the other, the implications from this strand of literature are often ambiguous from a normative perspective. In particular, there are several well known examples where free trade is actually detrimental for a given country.

One of the few papers which — to the best of our knowledge — addresses the

[21] This result is closely related to the previous one. Freeing trade in an extra commodity can be regarded as a move from restricted to free trade.

distributional effects of trade liberalization is Krugman (1981). The main idea is that an additional source for gains from trade makes Pareto gains more likely without any need for redistribution. The set-up is based on the Dixit–Stiglitz model of monopolistic competition which is one of the workhorses of this literature. The framework is fully symmetric: in both sectors production takes place under increasing returns to scale and uses one sector specific input. The rest of the world is modeled along the same lines, with the only difference being opposite relative factor endowments. The main result of the paper is that if products are perceived as sufficiently differentiated and/or if factor endowments are sufficiently similar, then Pareto gains from trade will arise even without redistribution. This result suggests that the distributional problem is less severe once we consider increasing returns to scale. Note, however, that this model does not allow for heterogeneity of tastes. This obviously facilitates the result.

Secondly, the literature surveyed so far is essentially static. The intertemporal interpretation of the Arrow-Debreu model falls short when markets reopen and governments take actions in response to earlier decisions, as is the case in practice. Contributions that incorporate all three of growth, trade, and distribution are rare, even though considerable work has been done on any combination of two of these issues. Aghion and Howitt (1998, page 371) offer a brief discussion of all three topics in the context of endogenous growth. Staiger and Tabellini (1987) discuss the time consistency of free trade when the government has distributional objectives and can (mis-) use import tariffs to this end. In Willmann (2000) we analyze how redistribution in the wake of trade liberalization provokes strategic reactions on part of the agents. Their under-investment can then prevent Pareto gains from trade.

2.2.9 Some remarks

Concluding this section an attempt is made to assess the general importance of the Pareto gains from trade theorem. Let us return to the two traditional efficiency theorems for a moment and see what can be inferred from them in the context of international trade. The first theorem implies that an international competitive free

trade equilibrium is a Pareto efficient allocation. This only implies that if autarky is worse for some individual(s) then it must be better for others. It cannot be worse for all residents of a country, though. As Debreu and Scarf (1963) show, a competitive equilibrium lies in the core. If the free trade equilibrium was worse for every resident of a country then they would form a coalition and block free trade, in which case free trade would not be in the core. Next consider with Grandmont and McFadden (1972) a "world allocation which is Pareto optimal and at least as satisfactory as autarky for each consumer in each nation". Then the second efficiency theorem says that under certain conditions there is a price vector at which this allocation is competitive. But for a free trade equilibrium to achieve this specific allocation at that price vector, transfers — including international transfers — will generally be required.

Against this background the Pareto gains from trade theorem certainly is a result in its own right. Note, however, that it only holds as long as the country is small and/or the status quo is autarky. In this case it does not require politically problematic international transfers but only domestic compensation. Yet herein already lie its practical limitations. The standard lump-sum compensation scheme — relevant as it may be to the theoretical argument — is largely irrelevant for practical policy. The second best alternatives are also haunted by practical problems.[22] Especially developing countries with their often limited ability to tax domestic transactions might be unable to implement such schemes and in addition free trade would spirit away their tariff incomes.[23] For developed countries, on the other hand, that usually have a sophisticated welfare system already in place, the compensation problem seems less severe.

2.3 Pareto gains from customs unions

When two or more independent states unite to form a common customs area this is called a customs union. Such unions are characterized by three criteria: (i) a common external tariff vis-à-vis third countries; (ii) the abolition of internal tariffs between

[22] See Hammond and Sempere (1995, p. 22).
[23] Dixit (1985, p. 339) mentions tariffs as a third best policy in this case.

member countries; and (iii) the distribution of the external tariff income among members. Other possible unions include free trade areas (that liberalize internal trade but where external economic relations including tariffs are still determined by each member state separately),[24] common markets (that in contrast to customs unions also allow internal factor mobility), and economic unions (that in addition to being a common market also harmonize their economic policies). Because it does not place restrictions on the kind of goods traded, the following discussion also encompasses common markets.

Economists' attitudes towards such unions have been ambiguous since Viner (1950). This ambiguity concerning the welfare implications of customs unions stems from two opposing effects: trade creation and trade diversion.[25] The former refers to newly created trade between member countries — because of the abolition of internal tariffs — which leads to efficiency gains and increases in welfare; the latter means that imports of one member country coming from the outside world are diverted away from low-cost suppliers in third countries to suppliers in other member states. Since external tariffs remain, the abolition of internal tariffs gives suppliers in other member countries an advantage although they might have higher costs than others who are located outside the union. This second effect leads to inefficient allocations and therefore has a negative effect on over-all welfare, thus the ambiguity.

Kemp and Wan (1976) abandon this "welter of inconclusive debate" and use the idea — already present in earlier work by Vanek (1962, 1965) and Kemp (1964) — of a common external tariff vector that maintains world prices at their pre-union levels and does not change the pattern of trade between the union and the rest of the world. Note that this rules out any possibility of trade diversion. The welfare position of the rest of the world does not change at all. Inside the union, however, free trade at new union-wide equilibrium prices will most likely lead to efficiency gains. Indeed they state and prove the following proposition:

> Consider any competitive world trading equilibrium, with any number of countries and commodities, and with no restrictions whatever on the tariffs and other commodity taxes of individual countries, and with costs

[24] See Panagariya and Krishna (1999) for a first attempt to show gains from free trade areas.
[25] See Viner (1950, p. 44).

> of transport fully recognized. Now let any subset of the countries form a customs union. Then there exists a common tariff vector and a system of lump-sum compensatory payments, involving only members of the union, such that there is an associated tariff-ridden competitive equilibrium in which each individual, whether a member of the union or not, is not worse off than before the formation of the union.

Note that their lump-sum system has two aspects: On the one hand, it is intended to achieve compensation between losers and winners within a given member country; on the other, it also aims at achieving compensation among the countries forming the union. Grinols (1981) extends this result by proposing a particular lump-sum scheme, which he argues is always feasible: Each individual in each member country receives a compensatory payment sufficient to purchase his old consumption bundle at the new union-wide equilibrium prices. Each member country as a whole receives transfers corresponding to its pre-union trade flows, a concept originally proposed by Ohyama (1972). Because intra-union trade in the status quo cancels out, the union-wide sum of these transfers is just the union's unchanged trade vector with the outside world — i.e., the resources needed for this compensation scheme correspond to the union's trade vector. When valued at world prices the assumption of balanced trade implies that its value is zero. Keeping in mind that the union's tariff receipts equal the difference between its trade valued at world prices and the same vector valued at new interior union prices, tariff income just equals the latter because the former is zero. Then it is evident that the resources for the compensation scheme when valued at the new union-wide prices equal its tariff income. Thus Grinols' scheme also provides a rule for distributing the union's tariff income. Note that even if the union does not trade with the outside world, this does not imply that there are no transfers between member countries; instead, the transfer system only becomes a zero-sum game. Kowalczyk and Sjöström (2000) propose a different compensation scheme in a model with national monopolies which involves slightly higher payments.

In analogy to their Pareto gains from trade result Dixit and Norman (1980, pp. 191–94) also propose a commodity tax scheme for the customs union case. As for the result with lump-sum compensation nothing changes for the outside world because

world prices are kept at their original level by an appropriately chosen common external tariff vector. Trade of the union as a whole does not change either. Inside the union on the other hand, producers are allowed to trade at internal free trade prices which differ from world prices because of the external tariff. Nevertheless there will be efficiency gains on the supply side of the union's economy. Consumers are guaranteed their old utility levels by a freeze of the complete price vector they face. This is done by means of carefully chosen taxes as in the Pareto gains from trade case. Only in this case those taxes differ in each member country because countries have to maintain their old prices, which were probably different, by taxes added to the new common interior producer prices. Then, after distributing the union's tariff income among member countries according to pre-union trades as above, governments can distribute the surplus to consumers in order to make everyone better off.

Hammond and Sempere (1995) show how this can be done using poll subsidies and prove that the new equilibrium exists. The problems raised by lump-sum compensation and also this second best scheme were already discussed in the context of Pareto gains from trade. An additional problem of the customs union case should be mentioned however: The result requires that there is compensation between member countries, which might not be politically acceptable.

Compared to the earlier results on Pareto gains from trade, the result on customs unions can be considered as a generalization in two respects:

- In the general customs union case some countries, namely the members of the union, move to free trade while the rest of the world stays shut out by the common external tariff. For the Pareto gains from trade result, this rest of the world is just the empty set.

- The customs union result envisages international compensation among member countries. Zero international transfers, as in the case of the Pareto gains from trade result, are definitely a special case.

The first point is obvious, the second might need further elaboration: The Pareto gains from trade result was derived without international transfers. This restriction limited the result somewhat — free trade was shown to be better than autarky,

and only autarky. In the case of customs unions with an internal transfer system, free trade inside the union is shown to be better than any form of restricted trade including autarky. Now, to obtain the previous result without international transfers in a customs union framework, intra-union transfers somehow have to be zero. This is obviously the case if every member country's status quo situation is autarky, because the intra-member compensation à la Grinols (1981) relates transfers to pre-union trade vectors. So the result, although it is a special case, is limited to the autarkic initial reference situation as well.

Realizing that customs unions can be seen as generalizing free trade seems to support the idea that forming such unions can be considered as a first step towards free trade.[26] Subsequent steps would be enlargements or mergers of unions, and the ultimate stage would be free trade — where it is understood that each step is potentially beneficial for everyone. The crucial point here is the way in which unions set their external tariffs. Kemp and Wan (1976) simply assume that they set them to keep world prices frozen. In the real world, however, they have no incentive to do so. Instead they will most likely use their newly acquired market power to set optimal tariffs. Thus several big unions might end up facing a prisoners' dilemma.

2.4 A note on migration

The results discussed so far hold for any number of goods. Since no distinction was made between finished goods and input factors they also apply to the latter. While huge capital flows, which take place internationally every day,[27] show that capital mobility is widely accepted, this seems to be much less the case with the international exchange of labor. The difference might be that capital can be supplied easily over long distances without any necessity for its owner to move, while this is clearly different in the case of labor. Here the owner usually would have to move, i.e. migration becomes necessary. Whatever non-economic reasons might speak against

[26] Cf. Kemp and Wan (1976).

[27] Admittedly, much of these flows might by caused by speculation instead of being related to production.

(or for) migration, our brief discussion — following Kemp (1993) — will be limited to direct economic considerations along the line of the above results.

If we apply the Pareto gains from trade theorem of section 2.3, the move from autarky to free trade including migration represents a Pareto improvement for any country, given suitable lump-sum compensation. This compensation scheme should include the country's autarkic population. Immigrants will not be included[28] but emigrants have to be. Although emigrants will be happy to receive lump-sum compensation, they will probably be unwilling to contribute. So such a scheme is bound to break down and a Pareto improvement might be impossible.[29] The customs union result seems to be more relevant in turn. By forming a customs union with free migration inside — what might then be called a common market — member countries should be able to realize gains. Since each individual must be part of the necessary compensation scheme anyway, the possibility of migration does not seem to pose any new constraints.

2.5 Conclusion

This paper has surveyed the literature on Pareto gains from trade. The results presented confirm the possibility of such gains if trade liberalization is accompanied by redistributive measures. For those who believe in the benefits of trade and are also concerned about social inequalities, this is a comforting finding. The literature reviewed here provides rigorous support for the intuitions of those early economists who made the case for gains from trade. Following the first formal proofs presented in 1972, several papers have strengthened and extended these results by proposing incentive compatible redistribution schemes. Pareto comparison is obviously a strong criterion and the political process will usually settle for less, allowing us some leeway when it comes to interpreting the necessary assumptions. The results presented here

[28] They might be participants of a scheme of their country of origin, though.

[29] Discussing the economic pros and cons of migration, it should not be forgotten that restricting migration might mean not only keeping immigrants out, but also preventing potential emigrants from leaving.

show that scaling back free trade is not a first best policy to deal with the detrimental side effects of liberalization, an important message to the protectionist opposition that has recently gained momentum as a result of globalization.

It is not our intention to deny the theoretical nature of the results and the practical difficulties when it comes to implementing trade adjustment programs. Lump-sum redistribution as well as the theoretically incentive compatible alternatives are far removed from real world policy making. They definitely suggest, however, that compensation is needed when implementing free trade policies and identify the direction those measures should take. In developed countries where effective welfare programs and progressive income taxation are firmly in place, this is less of a concern. For developing countries, on the other hand, this aspect deserves more attention. Liberalization should go hand in hand with redistribution to avoid socially disturbing inequalities and, in the extreme, to prevent anyone from falling below the subsistence level.

Chapter 3

The Gains from Duty-free Zones

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Abstract

Duty free zones have been established in many countries and duty free shops can be found in every major international airport. This paper investigates their welfare effect, in the tradition of the Pareto gains from trade literature. Using the dual approach developed in Dixit and Norman (1980), we show that the introduction of a duty free zone leads to Pareto gains over autarky. Compared to free trade, its welfare impact depends on the redistribution mechanism accompanying free trade. We show that with a Dixit-Norman tax scheme free trade is Pareto-inferior to a duty free zone regime. The opposite holds true for lump sum redistribution.

3.1 Introduction

Duty free zones have been established in many countries and duty free shops can be found in every major international airport. Most of us have probably visited one, but not everyone has considered their welfare implications.

Following the establishment of several such zones in developing countries in the late 1960s and 70s, economists started analyzing them. To our knowledge, Hamada

(1974) is the first important contribution. In it he investigates the impact of duty free zones in the standard Heckscher-Ohlin framework and reaches ambiguous conclusions about their welfare effect. This line of research is further pursued by Rodriguez (1976) and Hamilton and Svensson (1982) leading to similar results. Young and Miyagiwa (1987) open a new chapter by taking into account unemployment in a Harris-Todaro like economy. They conclude that the welfare effect of duty free zones is unambiguously positive. Miyagiwa (1993) extends this analysis focusing on where to locate the duty free zone in a developing country.

Our approach considers a somewhat different notion of duty free zone and stems from a different line of research, the literature on Pareto gains from trade. Kemp and Wan (1972) establish the Pareto superiority of free trade with lump sum redistribution over autarky. Dixit and Norman (1980), aware of the strong informational requirements of this compensation scheme, propose commodity taxation instead and show that their regime Pareto-dominates autarky. Feenstra and Lewis (1991) analyze the effects of free trade with redistribution through non-linear taxes in a partial equilibrium setting. They point out that a duty free zone can be regarded as a special case of non-linear taxation. Feenstra and Lewis (1994), now in a general equilibrium framework, claim, without providing a proof, the Pareto superiority of a duty free zone over autarky.

This paper provides the formal proof of the above claim for the tractable small country case — the relevant case for most developing countries. In addition we compare the welfare implications of a duty free zone to the situation arising from the above mentioned free trade regimes, i.e. lump sum redistribution or Dixit-Norman commodity taxation. We establish that duty free zones Pareto-dominate free trade with Dixit-Norman taxes, but in turn are dominated by free trade with lump sum transfers. Subsequently we derive implications from our theoretical analysis for the implementation of duty free zones.

The outline of the paper is as follows. In section 3.2 we introduce the formal framework based on the dual approach as presented in Dixit and Norman's seminal book. Section 3.3 formally establishes the Pareto superiority of a duty free zone over autarky and provides a graphical illustration of the argument. In section 3.4 we use

the Pareto criterion to rank our duty free zone vis-à-vis the two free trade regimes. Section 3.5 offers concluding remarks and suggestions for further research.

3.2 The formal framework

In this section we set up the formal framework for our analysis. We model explicitly one country vis-à-vis the rest of the world.

First consider the consumption side of this country. Let there be N consumers indexed by $h \in \{1, ..., N\}$ and characterized by their excess expenditure functions $e_h^*(p, w, u)$ which are defined as

$$e_h^*(p, w, u) \equiv \min_{c,v}\{pc_h - wv_h \mid u_h(c_h, v_h) \geq u\}$$

where c_h and v_h are respectively the consumption and factor supply vectors, p and w the corresponding price vectors, and $u_h(c_h, v_h)$ their utility functions. The excess expenditure function indicates the minimum lump sum transfer needed to attain the utility level u at given prices (p, w). In what follows we assume that e^* has all the usual properties[1]. Note that we have allowed complete heterogeneity of agents.

On the production side we assume constant returns to scale and price taking profit maximization. Formally this can be described by

$$\max_{x,v}\{px - wv \mid (x, v) feasible\}$$

where x and v are respectively the output and input vectors and p and w the corresponding prices. We think of the rest of the world as being characterized by the vector valued excess demand function $c_{row}(p)$ which satisfies $pc_{row}(p) = 0$. Putting things together the autarkic equilibrium is defined as a vector of prices (p, w) such that

$$\sum_{h=1}^{N} v_h = v \ \wedge \ \sum_{h=1}^{N} c_h = x$$

while international equilibrium is defined similarly by replacing the second equation

[1] Cf. Deaton and Muellbauer (1980, chapter 2) and Dixit and Norman (1980, also chapter 2).

with

$$\sum_{h=1}^{N} c_h + c_{row} = x$$

At this point we turn to the main subject of this paper, namely duty free zones. We understand a duty free zone to be an area (not necessarily in the geographical sense), where consumers can trade at international prices after having paid an entrance fee $t \in \Re$. It is assumed that, if a consumer is indifferent to entering or staying out, she enters.[2] Producers are exposed to world market prices and we also assume that it is not possible for goods purchased at international prices in the duty free zone to be resold to outsiders.

Before closing this section let us briefly consider another relevant concept, the commodity tax scheme proposed in Dixit and Norman (1980). The idea is to keep the price vector faced by consumers constant at the autarky level while exposing the production side to international prices. This is achieved by means of appropriate excise taxes/subsidies on commodity and factor transactions. It guarantees that consumers will make the same choices as under autarky and therefore attain their autarkic utility levels. In contrast to lump sum transfers the Dixit-Norman tax scheme is incentive compatible.[3]

3.3 Pareto gains from duty free zones for a small country

In this section, we analyze the impact of duty free zones on a small economy, i.e. an economy which takes world prices as given and which does not influence them even passively. Without loss of generality, let individuals be ordered so that $e_h^*(p^1, w^1, u_h^a)$ is decreasing in h, where p^1 and w^1 are the world prices for commodities and factor

[2]This is a purely technical assumption that guarantees entry by at least one consumer in the pathological no gains from trade case. It is incentive compatible because the decsision to enter or stay out does not affect neither the consumer's nor the government's budget position and therefore will not lead to any change in government policy.

[3]The classic reference on incentive compatibility is Hammond (1979). For a discussion of this specific issue cf. Hammond and Sempere (1995) and for a different perspective cf. Wong (1995).

inputs, and u_h^a is the autarkic utility level of individual h. Since $e_h^*(p^1, w^1, u_h^a)$ can be thought of as the hypothetical transfer needed to keep agents indifferent between autarky and free trade at given world prices, we have ordered them so that individual 1 is the biggest loser while N is the top winner from free trade.

Let us consider the situation in which the government sets up a duty free zone with an entrance fee of t. In addition, the production side is exposed to free trade and people who do not enter the duty free zone are kept at their autarkic utility levels by means of Dixit-Norman commodity taxes. We are now able to prove our first result.[4]

Theorem 1 *There exists a feasible duty free zone with an entrance fee t, which is frequented by a non-empty subset of the population, and a Dixit-Norman tax scheme for the rest of the economy, which leads to a Pareto improvement over autarky.*

Proof: Let $t = -e_M^*(p^1, w^1, u_M^a)$ for some $M \in \{1, ..., N\}$, where M is the marginal agent, i.e. the agent that is indifferent to entering the duty free zone or staying out, and enters by assumption. The number of people R who are willing to enter the duty free zone is then greater or equal[5] to $N - M$. We are left to show that a marginal agent M and a fee t exist such that this policy is feasible, i.e. that the government budget B_{DF} is non-negative. The government budget can be written as

$$\begin{aligned} B_{DF} &= (p^a - p^1) \sum_{h=1}^{N-R} c_h^a + (w^1 - w^a) \sum_{h=1}^{N-R} v_h^a + Rt \\ &= w^1 \sum_{h=1}^{N-R} v_h^a - p^1 \sum_{h=1}^{N-R} c_h^a - Re_M^*(p^1, w^1, u_M^a) \end{aligned}$$

where the second equality follows from the individual agents' budget constraints in autarky, $p^a c_h^a = w^a v_h^a \ \forall h \in \{1, ..., N\}$. Now, let $M = N$ so that $t = -e_N^*(p^1, w^1, u_N^a)$. It follows that

[4] This result is in the spirit of *some trade is better than no trade* although here *some trade* entails non-linear taxation whereas most of the literature considers linear taxes or tariffs.

[5] Strictly greater if there are ties.

$$\begin{aligned} B_{DF} &= w^1 \sum_{h=1}^{N-1} v_h^a - p^1 \sum_{h=1}^{N-1} c_h^a - e_N^*(p^1, w^1, u_N^a) \\ &\geq w^1 \sum_{h=1}^{N-1} v_h^a - p^1 \sum_{h=1}^{N-1} c_h^a + (w^1 v_N^a - p^1 c_N^a) \\ &= w^1 \sum_{h=1}^{N} v_h^a - p^1 \sum_{h=1}^{N} c_h^a = w^1 v^a - p^1 x^a \\ &\geq w^1 v^a - p^1 x^1 = 0 \end{aligned}$$

The second line is implied by the definition of the expenditure function, while the fourth line follows from profit maximization and from the assumption of constant returns to scale. □

Remark. We have rigorously shown only that consumer N is indifferent between entering the duty free zone and facing the autarkic price vector, but except for the pathological case of no gains from trade, the tax authorities can lower the fee and thereby increase the number of consumers willing to enter the duty free zone and also enable them to realize gains from trade beyond indifference.

The situation is depicted in figure 3.1. The diagonal line represents the potential gains from free trade for individuals 1 to N. Consumers 1 to M decide to stay out of the duty free zone because their potential gains do not exceed the entrance fee. Their utility is kept unchanged with respect to autarky by means of a Dixit-Norman set of commodity taxes. Individuals to the right of M decide to enter, obtaining gains from trade after paying the entrance fee. The actual welfare gains are depicted by the bold line.

We have argued above that the government should lower the entrance fee. It is intuitive and easy to prove that the government budget decreases with the fee. Let us consider the case of free entry, that is a fee of zero. Only the potential losers will stay outside under the umbrella of the Dixit-Norman tax scheme, but since the government does not collect any revenue from the gainers this policy is feasible only

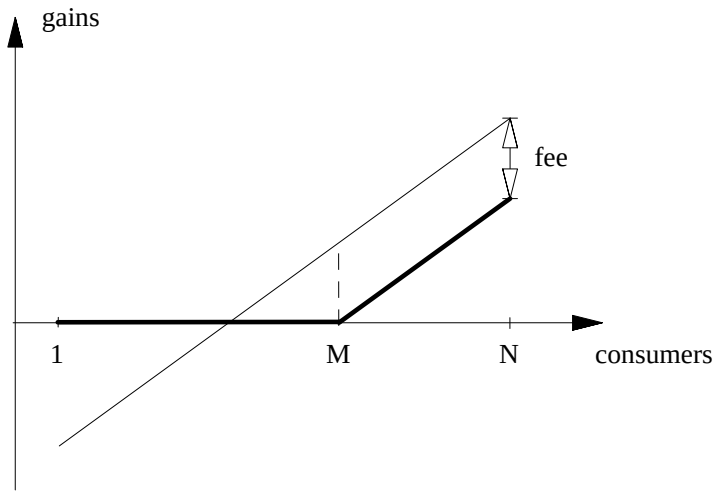

Figure 3.1: Gains from duty-free zone

if there are no losers and everyone enters the duty free zone. For similar reasons negative entrance fees are not of interest.

3.4 Pareto ranking free trade and duty free zones

In the previous section we have established the Pareto superiority of duty free zones over autarky. Our objective in what follows is to compare duty free zones to free trade. Obtaining a Pareto ranking requires the use of a redistribution mechanism under free trade. First, let us consider commodity taxation à la Dixit Norman for every consumer in the economy. Dixit and Norman (1980) have shown that the resulting government budget is non-negative. So, except for the pathological case of no gains from free trade, there will be a budget surplus that can be distributed to consumers by means of lump sum transfers thereby leading to a Pareto improvement over autarky.[6]

[6]There is an issue here whether this is possible, cf. the exchange between Kemp and Wan (1986) vs. Dixit and Norman (1986), but impossibility to do so would make our alternative look even more attractive.

Duty free zones can simply be regarded as an alternative way of distributing the surplus to consumers. The fact that those who enter the duty free zone can realize additional gains from substitution on the consumption side is the intuitive argument behind our next result. Without any specific assumption about how the budget surplus is distributed under free trade with Dixit-Norman taxes, it is not possible to obtain a Pareto ranking. Therefore, we consider a lump sum scheme that aims at reproducing the welfare position of consumers which prevails under the duty free zone.

Theorem 2 *Any feasible duty free zone Pareto dominates free trade with Dixit-Norman commodity taxes where the surplus from the latter scheme is distributed in an attempt to mimic the duty free zone outcome.*

Proof. As we have seen in the previous section, the government budget under the duty free zone regime is given by

$$B_{DF} = (p^a - p^1) \sum_{h=1}^{N-R} c_h^a + (w^1 - w^a) \sum_{h=1}^{N-R} v_h^a + Rt$$

Under free trade with a Dixit-Norman tax scheme the budget amounts to

$$\begin{aligned} B_{FTDN} &= (p^a - p^1) \sum_{h=1}^{N-R} c_h^a + (w^1 - w^a) \sum_{h=1}^{N-R} v_h^a + \\ &+ (p^a - p^1) \sum_{h=N-R+1}^{N} c_h^* + (w^1 - w^a) \sum_{h=N-R+1}^{N} v_h^* - \\ &- \sum_{h=N-R+1}^{N} e_h^*(p^a, w^a, u_h^{df}) \end{aligned}$$

where c_h^* and v_h^* are, respectively, the Hicksian consumption and factor supply vectors at autarky prices and duty free zone utility levels u_h^{df}. The last term stands for the lump sum transfers to consumers who would otherwise have profited from entering the duty free zone. We want to show that $B_{DF} - B_{FTDN} \geq 0$, i.e. that

$$Rt - (p^a - p^1) \sum_{h=N-R+1}^{N} c_h^* - (w^1 - w^a) \sum_{h=N-R+1}^{N} v_h^* +$$

$$+ \sum_{h=N-R+1}^{N} e_h^*(p^a, w^a, u_h^{df}) \geq 0$$

Since $p^a c_h^* - w^a v_h^* = e_h^*(p^a, w^a, u_h^{df})\ \forall h \in \{N-R+1, ..., N\}$, this is the case if

$$Rt + p^1 \sum_{h=N-R+1}^{N} c_h^* - w^1 \sum_{h=N-R+1}^{N} v_h^* \geq 0$$

By definition of the expenditure function $p^1 c_h^* - w^1 v_h^* \geq e_h^*(p^1, w^1, u_h^{df}) \forall h \in \{N-R+1, ..., N\}$. Therefore we have

$$Rt + p^1 \sum_{h=N-R+1}^{N} c_h^* - w^1 \sum_{h=N-R+1}^{N} v_h^* \geq Rt + \sum_{h=N-R+1}^{N} e_h^*(p^1, w^1, u_h^{df}) = 0$$

where the last equality follows from $e_h^*(p^1, w^1, u_h^{df}) = -t \forall h \in \{N-R+1, ..., N\}$. □

Note that this result holds *a fortiori* if the Dixit-Norman surplus is simply disposed of.

Let us now consider the case of free trade with lump sum redistribution. The following result is included to complete the ordering and does not come as a surprise given the first best nature of free trade with lump sum transfers.

Theorem 3 *There exists a lump sum redistribution scheme such that free trade Pareto-dominates any feasible duty free zone.*

Proof. Let the lump sum scheme be such that consumers who did not enter the duty free zone are kept at their autarkic utility levels while the former entrants still have to surrender t as a lump sum payment. Then

$$B_{FTLS} = -\sum_{h=1}^{N-R} e_h^*(p^1, w^1, u_h^a) + Rt \geq w^1 \sum_{h=1}^{N-R} v_h^a - p^1 \sum_{h=1}^{N-R} c_h^a + Rt = B_{DF}$$

by definition of the expenditure function. □

The results are summarized in figure 3.2. Free trade with appropriate lump sum redistribution Pareto-dominates any feasible duty free zone, which is Pareto-superior to free trade with a Dixit-Norman tax scheme. This last regime in turn dominates autarky, establishing the ordering depicted in figure 3.2.

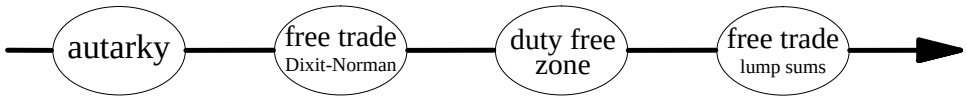

Figure 3.2: Pareto ranking

When evaluating these results, it is important to note the different informational requirements. Free trade with lump sum transfers presupposes that the government knows the welfare position of each single agent before and after liberalization. It was this unrealistically strong assumption of omniscience which led Dixit and Norman to propose their commodity tax scheme. Here we have shown that one can improve upon their scheme without any additional information by establishing a duty free zone. Note, however, that all the arguments raised against the Dixit-Norman[7] tax scheme also apply to our duty free zone, because we used such taxes to warrant the autarkic utility levels of outsiders. Furthermore, there is no reason to believe that duty free zones are the optimal form of redistribution through non-linear taxation.

[7] Implementation of this tax scheme requires bureaucrats to freeze prices through carefully chosen taxes. This will not only be extremely demanding in terms of information and resources, but different tax rates invite rent seeking. In addition, it is hard to imagine how different production and consumption prices can be enforced for production units, such as farms, who also consume part of their output. Finally, if we take the assumption of constant returns to scale to stand for decreasing returns plus specific entrepreneurial factors, different tax rates for these factors imply varying tax rates for pure profits, which is impossible even conceptually.

3.5 Concluding remarks

The concept of duty free zone analyzed above differs from real world examples on two counts: In our conceptualization we assume the production side of the economy to be completely exposed to international competition, while in the real world this is only the case for businesses located within the limited area of the duty free zone. Second, we use Dixit-Norman commodity taxation for people staying outside the zone, which is somewhat unrealistic (cf. footnote 7), although it has a distant counterpart in redistributive tax policies. On the other hand note that we obtain an ordering according to the Pareto criterion, an extremely strong comparative result. The political decision process will usually settle for less than such a strong ordering, thus allowing us some leeway when it comes to interpreting the requirements necessary for our results. Nevertheless it is worth emphasizing that the contribution of this paper is mainly theoretical. We show that our notion of a duty free zone Pareto-dominates free trade with a Dixit-Norman tax scheme and we improve upon that regime without any additional informational requirements. This analysis has been fully developed for the static small country case. The extension to the more general large country setting poses some technical difficulties: The price vector prevailing on international markets (and therefore also in the duty free zone) is now endogeneously determined by the make-up of the zone itself. In addition, the ordering of consumers according to their potential gains from trade will depend on world prices. Proving similar results for this case is left for further research as is the extension to a dynamic setting.

Chapter 4

Redistribution — Help or Hindrance?

Abstract

This paper generalizes the usual Pareto gains from trade literature by adding an explicit time dimension. In a two-stage general equilibrium model with a continuum of heterogeneous agents, we analyze the distributional implications of an anticipated move from autarky to free trade. We verify that there are Pareto gains from trade if the government redistributes only in the first period. If, however, agents anticipate government redistribution after the reform, Pareto gains may be impossible. Ability-dependent, first-period subsidies/taxes on human capital acquisition remedy this problem, as does Dixit–Norman taxation when ability is private information.

4.1 Introduction

Market liberalization has been an essential ingredient of most recent economic reform programs and it is a dearly held conviction among economists that such reforms are beneficial. The profession usually concedes that an unfortunate few might lose in the presence of aggregate gains but is confident that this problem can (or at least could) be overcome by appropriate redistribution. In practice, compensation has often been crucial to fend off the considerable opposition forming against liberalization proposals. Those segments of the population that stand to lose and therefore oppose the reforms

receive compensation of one form or another in order for the reforms to be accepted politically.

The idea that aggregate gains from trade can be redistributed to achieve an actual Pareto improvement has been analyzed in a series of contributions.[1] Using different forms of redistribution,[2] the Pareto gains from trade literature establishes this result in static general equilibrium models. In this paper, we address the question of whether such redistribution leads to strategic behavior on part of the agents. If people expect to be compensated for losses or to contribute towards payments in the wake of the reform, will this influence how well they prepare for the liberalized economy? And if it does, could this strategic behavior potentially sabotage the gains from trade?

Indeed, once one acknowledges the dynamic nature of trade liberalization, the issue at stake is the time consistency, or rather subgame perfection, of such a policy mix.[3] Staiger and Tabellini (1987) question the time consistency of free trade when the government has distributional objectives but limit their analysis to one policy instrument: protection. This instrument is then also used[4] for distributive purposes, thus giving rise to the time inconsistency of free trade.

We take the commitment to free trade as given — possibly achieved through a commitment device such as the GATT/WTO — and explicitly consider redistributive policies proper. As Hammond (1999) shows in a closed economy framework, redistribution can lead to strategic underinvestment. This detrimental strategic effect also arises in the context of trade adjustment programs, as Bliss (1990) points out. Agents find it optimal to act strategically prior to the reform in order to influence

[1] These include Grandmont and McFadden (1972), Kemp and Wan (1972), Chipman and Moore (1972), Dixit and Norman (1980), Kemp and Wan (1986), Dixit and Norman (1986), Feenstra and Lewis (1991), Feenstra and Lewis (1994), Hammond and Sempere (1995), and Facchini and Willmann (1999) — for a recent survey see Facchini and Willmann (2000).

[2] Lump-sum transfers, Diamond–Mirrlees style commodity taxation, and non-linear taxation have been studied in this chronological order.

[3] See Kydland and Prescott (1977) for instructive examples of the time consistency problem. Their seminal work has influenced many areas of economics. In the trade context, contributions include Matsuyama (1990) and Tornell (1991) who analyze the time consistency of infant industry protection, Lapan (1988) who questions the time consistency of the optimal tariff, and Staiger and Tabellini (1987).

[4] One is tempted to say *misused*.

their compensation (payments). In doing so they create a legacy[5] that affects not only themselves but everyone in later periods. The government, at that later stage, adjusts compensation to the given circumstances. And it is the private agents' anticipation of the government's reoptimization in the later period subgame that leads them to behave strategically in the first place. The interesting new question in the trade context is whether this effect might wipe out the gains from trade.

To address this question formally we set up a two-stage general equilibrium model with a continuum of heterogeneous agents who differ in their abilities to acquire skills. We solve this model for the autarky case as a reference point and then compare it to free trade without redistribution to highlight the distributional consequences of trade liberalization. Before addressing the strategic effect, we verify that Pareto gains are possible if the strategic affect is absent by assuming that the government only redistributes in the first period and credibly commits to remain inactive thereafter. If, on the other hand, the government is free to use lump-sum redistribution[6] in the second period, we show that Pareto gains can be impossible to achieve. There exists a critical level of gains from trade, below which the strategic effect dominates and Pareto gains are impossible.

In response to this negative result, we discuss possible remedies. We show how ability-dependent subsidies and taxes on human capital acquisition in the first period can be used to avoid the strategic effect and achieve Pareto gains from trade. This solution depends on the government's knowledge of individual agents' abilities. If these are private information, we show that freezing consumer prices and exposing the production side to the world market, as proposed in Dixit and Norman (1980), also leads to Pareto gains from trade. The latter scheme is dominated by the first solution, however.

The outline of the paper is as follows. In section 4.2, we set up the model. In section 4.3, we solve it for the autarky equilibrium before turning to free trade and its distributional consequences in section 4.4. We give an introductory discussion of

[5]Following the terminology introduced by Kaneko and Wooders (1986), Hammond (1999) calls it a "widespread externality".

[6]This is the conventional first-best policy instrument that features so prominently in the static Pareto gains from trade literature.

redistribution in section 4.5. In section 4.6, we then verify the conventional Pareto gains from trade result if the government can commit. Section 4.7 presents our first main result, that Pareto gains can be impossible with redistribution in the wake of the reform. In section 4.8, we discuss remedial policies and section 4.9 offers concluding remarks.

4.2 The Model

This section sets up a two-stage general equilibrium model which captures the relevant effects without striving for generality. It could easily be generalized, of course, but we refrain from doing so in this paper because our theoretical objective is to establish a counter example.

Let there be a continuum[7] of agents $a \in [0,1]$, where the index a denotes the agents' abilities to become skilled. Suppose that a is uniformly distributed on $[0,1]$. In the first period all agents are endowed with one unit of a perishable consumption good. They can either consume their endowment in full or else decide to become skilled. The cost of becoming skilled depends on ability. Agent a has to give up $1-a$ of her endowment to become skilled. That is, the most able agent ($a = 1$) can become skilled for free while at the other end of the spectrum the least able agent ($a = 0$) can only become skilled by giving up his entire endowment.

One may think of this stylized first period as the reduced form of a more complex setup where agents make both production and within-period consumption decisions. The crucial feature is that the agents decide on their human capital investment. Note that with only one good there will be no trade in the first period because we do not consider intertemporal trade.[8] Without trade in the first period, trade liberalization affects only the second period and can be thought of as a reform enacted (if it is)

[7] As discussed in Hammond (1999) the use of a continuum rules out strategic price manipulation. This allows us to concentrate on dynamic investment behavior that we consider to be of far more importance in large economies.

[8] The introduction of asset markets leads to similar strategic behavior, see Hammond (1999). We have chosen to focus on human capital instead, because wage differentials are of considerable interest in the trade context and considering both would unnecessarily complicate matters by requiring portfolio decisions.

between the first and the second period.

In the second period agents are endowed with one unit of labor — skilled labor if they became skilled and unskilled labor otherwise — that they supply inelastically. Each agent derives utility from the consumption of one high-tech good h and one basic good b according to the Cobb–Douglas utility function $u = x_h^\beta x_b^{1-\beta}$ where $0 < \beta < 1$. Their common intertemporal utility function is the product of the amount consumed in the first period and their second period utility — i.e., $U = au$ for those who become skilled and $U = u$ for those who do not. Note that the utility function is *a priori* identical for all agents so heterogeneity in this model stems only from differing abilities.

On the production side we have two sectors. We assume constant returns to scale so that the number of firms in each sector is immaterial. One sector produces the high-tech good according to the Cobb–Douglas production function $Y_h = L_s^\alpha L_u^{1-\alpha}$ where $0 < \alpha < 1$. The second (degenerate) sector turns unskilled labor into the basic good one-for-one — i.e., its production function is the identity function $Y_b = L_u$. This last assumption is made to give us a more tractable solution by eliminating one price — the price of the basic good will obviously equal the unskilled wage in any equilibrium with strictly positive production in this sector. Speaking of prices, let us denote the price of the high-tech good by p and the wage for skilled labor by w. Furthermore, we normalize the price of the basic good — and with it the wage for unskilled labor — to one.

In addition to consumers and producers, there is the government that can carry out redistributive policies. We will discuss the political economy behind its objectives, the policy instruments at its disposal and their timing, as well as the strategic interaction with the other agents in greater detail below. Before doing so, however, let us turn our attention to the distributional effects of trade liberalization when the government remains inactive, that is, under *laissez faire*.

4.3 Autarky

To analyze the distributional effects of trade liberalization, we first solve the model for the autarky case. This is not only a useful reference point, but solving this simple case allows us to point out some interesting features of the model that will prove useful when discussing other cases further down the line.

Maximization of the Cobb–Douglas utility function leads agents to spend a proportion β of their income on the high-tech good and the rest on the basic commodity. This results in the following demand functions:

$$x_h = \begin{cases} \beta/p \\ \beta w/p \end{cases} \quad \text{and} \quad x_b = \begin{cases} (1-\beta) & \text{if unskilled} \\ (1-\beta)w & \text{if skilled} \end{cases}$$

Plugging back into the respective intertemporal utility functions yields the following indirect utility:

$$V(p,w) = \begin{cases} \mathcal{B}p^{-\beta} & \text{if unskilled} \\ a\mathcal{B}p^{-\beta}w & \text{if skilled} \end{cases} \tag{4.1}$$

$$\text{where} \quad \mathcal{B} = \beta^{\beta}(1-\beta)^{1-\beta}$$

Comparison of the indirect utilities for skilled and unskilled agents leads to a critical ability level of $a_c = 1/w$, the ratio of unskilled to skilled wages. Agents with $a > a_c$ will decide to become skilled whereas those with $a < a_c$ prefer to stay unskilled.[9] Given these decisions and the uniform distribution of abilities in $[0,1]$, aggregate labor supply takes the form

$$L_u = a_c = 1/w$$

and

$$L_s = 1 - a_c = 1 - 1/w \tag{4.2}$$

The aggregate demand functions are

$$X_h = a_c\beta/p + (1-a_c)\beta w/p = \beta(w - 1 + 1/w)/p \tag{4.3}$$

[9]The agent $a = a_c$ is indifferent but having zero mass his/her decision can be assumed to go either way.

and

$$X_b = a_c(1-\beta) + (1-a_c)(1-\beta)w = (1-\beta)(w - 1 + 1/w)$$

On the production side, because of constant returns to scale, in any equilibrium with strictly positive production the output prices must equal unit costs. We already used this result for the basic sector when we normalized both the price of the basic good and the unskilled wage to one. For the high-tech sector, cost minimization leads to conditional factor demands

$$L_{u,h} = Y_h \left(\frac{1-\alpha}{\alpha} w\right)^{\alpha}$$

and

$$L_{s,h} = Y_h \left(\frac{1-\alpha}{\alpha} w\right)^{\alpha-1} \tag{4.4}$$

Imposing the zero profit condition then yields

$$p = \mathcal{A}^{-1} w^{\alpha} \quad \text{where} \quad \mathcal{A} = \alpha^{\alpha}(1-\alpha)^{1-\alpha} \tag{4.5}$$

To solve for the equilibrium, substitute equation (4.5) for p into equation (4.3), substitute X_h for the output into the conditional factor demand (4.4), and set demand equal to supply in the skilled labor market, i.e., set the result equal to the supply of skilled labor as given by equation (4.2). The resulting quadratic equation has two roots: one positive and one negative. Ignoring the negative root gives an autarky skilled wage of

$$w^A = \frac{1}{2} + \sqrt{\frac{1}{4} + \frac{\alpha\beta}{1-\alpha\beta}}$$

Equation (4.5) then allows us to obtain the autarky price for the high-tech good, which is

$$p^A = \mathcal{A}^{-1} \left(\frac{1}{2} + \sqrt{\frac{1}{4} + \frac{\alpha\beta}{1-\alpha\beta}}\right)^{\alpha}$$

Note that the skilled wage is greater than one, representing the skill premium over the unskilled wage. We also see that it increases in α, meaning that a higher marginal productivity of skilled labor increases the wage for this factor. Both the wage of

skilled labor and the price for the high-tech good increase in β, indicating that a stronger preference for the high-tech good leads to a higher price for this good and to a higher wage for the factor used exclusively in its production.

4.4 Distributional Effects of Free Trade

We now turn to a scenario where the country embraces free trade after the initial period has passed and does not carry out any redistribution. The standard small country assumption[10] allows us to work with a given world market price vector. We take the world price for the high-tech good to be $p^* = bp^A$. Taking a first world perspective, we will discuss the case where $b > 1$.[11] This is the case of an industrialized country with a low price for the high-tech good under autarky. When it liberalizes, demand for this commodity increases and its price rises from p^A to $p^* = bp^A > p^A$.

Since the country under consideration will specialize in the production of the high-tech good, production will be strictly positive in this sector. Then equation (4.5) gives us the skilled wage under free trade, which is

$$w^* = (\mathcal{A}p^*)^{1/\alpha} = (\mathcal{A}bp^A)^{1/\alpha} = b^{1/\alpha}w^A \tag{4.6}$$

From the fact that $b^{1/\alpha} > b$ we see that the skilled wage increases more than proportionally compared to the price increase for the high-tech good, a manifestation of the Stolper–Samuelson effect.

In passing, let us point out that this new price vector will lead to a change in the production and consumption patterns. We already noted that production will shift toward the high-tech good. On the consumption side, agents will consume relatively more of the basic good and less of the high-tech good due to the relative

[10] Since this assumption is usually understood to exclude even a passive influence on price, one should more appropriately speak of an infinitesimal country. We invoke it here to avoid the added complexity of finding the world market equilibrium price. This is a special case, of course, but the counter example we develop below obviously applies to the more general case, too.

[11] Our asymmetric model with its explicit high-tech and degenerate basic sector is obviously geared towards this case. If one wanted to discuss developing countries, one should probably focus on other sectors, such as agriculture and low-tech manufacturing. In our framework, in the case when $b < 1$ trade would lead to less human capital acquisition, aggravating the problems we will explore.

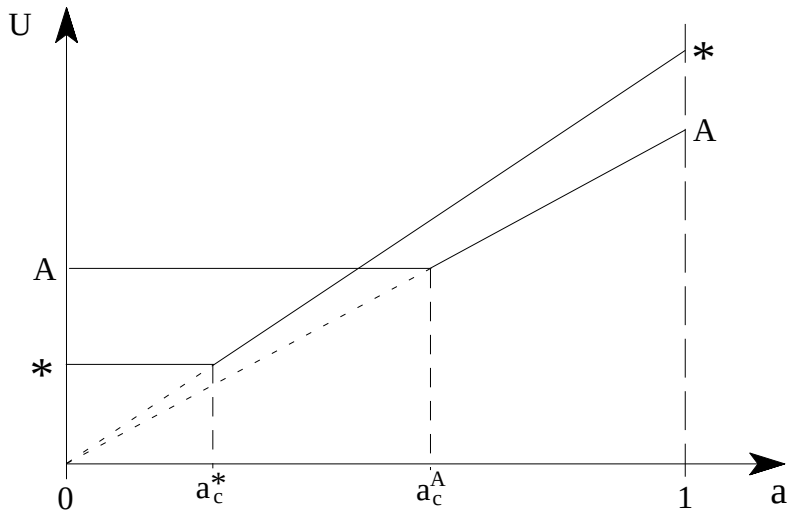

Figure 4.1: Distribution of intertemporal utility

price change. In any case, the small country assumption guarantees market clearing because it implies an infinitely elastic import supply and export demand, while the skilled wage w^* clears the labor markets.

We now address the distributional consequences that are our main concern. In view of our aim to investigate Pareto gains, we concentrate on utility instead of income. The indirect utility function (4.1), together with the equilibrium prices and wages derived above, gives us a clear picture of the distributional impact of the trade liberalization. In figure 4.1, the AA schedule indicates the utility level attained in autarky and the ** schedule shows the utility level under free trade for all agents $a \in [0, 1]$.

First note that the critical level of ability has changed due to liberalization. Since the skilled wage is higher under free trade and becoming skilled is therefore more profitable, we see that $a_c^* \ (= 1/w^*) \ < a_c^A \ (= 1/w^A)$. This leads us to distinguish three groups: those with $a > a_c^A$ who become skilled regardless of the regime, those with $a < a_c^*$ who do not become skilled in either regime, and finally the middle group who do not become skilled under autarky but find it beneficial to do so under free trade.

The high-ability group clearly gains from trade liberalization because its second-period real income increases. The low-ability agents, on the other hand, lose since their second-period real income falls. The group in the middle is of more interest because these agents change their decisions whether to become skilled. Under autarky, they decide not to become skilled whereas under free trade they do. They give up income in the first period, invest in education, and then reap the higher real income of skilled workers in the second period. Within this group, the higher ability types attain a higher utility level than under autarky whereas the lower ability agents, for whom becoming skilled is more costly, lose. Even these losers prefer to become skilled, however, because they would lose even more otherwise. Note that this change in decisions leads to additional dynamic gains from trade, which go beyond the well-known static gains, because the proportion of agents for whom the benefits of acquiring skills outweigh the costs increases.

There are many intermediate regimes of more- or less-restricted trade whereas we have only considered the two extreme cases of autarky and free trade. For our small country, any move towards freer trade — in the sense of closing the gap between domestic and world market relative price — will have distributional implications similar to the extreme change of regimes discussed above.[12] For large countries, on the other hand, a change in the tariff rate can potentially lead to the Metzler paradox, with the tariff and domestic price moving in opposite directions.

4.5 Redistribution

The distributional analysis above shows that the gains from trade are distributed unevenly, taking the form of losses for some agents. This is the motivation and starting point for the literature on Pareto gains from trade. That literature analyzes how different redistribution mechanisms can be used to achieve actual Pareto gains. In what follows, we will attempt to give a political economy rationale for this approach and discuss issues that arise in the dynamic context of our model.

Hardly any country practices completely free trade and further liberalization is

[12] This only holds if the tariff revenue or the quota rent is distributed uniformly.

therefore always an imminent political question. The reference point against which the potential effects of such a reform will be measured is the status quo.[13] The potential winners and losers from trade liberalization will both have an interest in influencing the political process. The political economy side often argues that these influences are asymmetric because losses tend to be more concentrated and losers therefore find it easier to overcome the free-rider problem and lobby for protection. Tellingly, Grossman and Helpman (1994) offer "protection for sale" and not — at least not explicitly — free trade.[14]

If this asymmetry is extreme, the government's primary concern will be to avoid losses for any subset of the population, while increasing national welfare is of secondary importance.[15] It will undertake trade liberalization only in combination with redistribution. Winners have to compensate losers to ensure a Pareto improvement. Note that redistribution in this context serves solely as a means of preventing losses and not to further more ambitious goals. Even if one is not willing to take the Pareto criterion literally to this extent, it will usually be a strong sufficient condition for political acceptability. Skeptics could point out that some rather unappealing allocations are Pareto efficient. This criticism, however, would apply more to the status quo than to Pareto improvements. Our paper follows the static literature in using the Pareto criterion because it is this literature we intend to extend.

In addition to the government's objective, we also need to discuss the instruments at its disposal and — of special importance in the dynamic context — the timing

[13]Note that the status quo is arbitrary. It might be the optimal outcome of the political decision-making process and the current economic system excluding the possibility of trade liberalization. If it is not then there will be room for other reforms — possible and likely but beyond the scope of this paper.

[14]To do their seminal contribution justice, however, note that in their second example, where everyone has a stake in an industry that lobbies, the outcome is basically that those industries pay for free trade.

[15]At this point we could introduce an explicit government objective function. Grossman and Helpman (1994), for example, assume that the government maximizes a weighted sum of political contributions and a utilitarian social welfare function like that considered by Chipman and Moore (1972). The Pareto criterion could be represented by a maximin social welfare function. We refrain from doing so here because it is not needed for our analysis below that concentrates on Pareto gains.

of their use. As for the instruments, the static literature considers lump-sum transfers, Diamond–Mirrlees style commodity taxation, and non-linear taxation.[16] In this paper, we concentrate on lump-sum transfers and also consider commodity taxation in the context of remedial policies. Although we are aware of the unrealistically strong informational requirements of lump-sum transfers and the resulting incentive incompatibility, we would like to demonstrate that strategic behavior can sabotage the gains from trade when there is complete information.[17]

Regarding the timing within periods, we assume that the government moves first, taking the position of a Stackelberg leader. This assumption seems natural in light of who the players are.[18] As for the timing across periods, we consider two extreme cases. In the next section, we analyze the case where the government carries out redistribution in the first period and successfully commits to remain inactive in the second period. Subsequently, we analyze strategic reactions when the government is free to use redistributive policies in the second period.

4.6 Conventional Pareto Gains

Before turning attention to the strategic effect, this section verifies that Pareto gains are possible in our model when the effect is absent. To this end we assume that the government undertakes redistribution in the first period only and refrains from any intervention thereafter. Whether such government behavior is credible and subgame perfect will be discussed below. For the moment we assume that the government has found some commitment device so that agents rationally expect it to be inactive after

[16] Grandmont and McFadden (1972), Kemp and Wan (1972), and Chipman and Moore (1972) use lump-sum transfers; Dixit and Norman (1980) apply Diamond–Mirrlees taxation in this context; and Feenstra and Lewis (1991), Feenstra and Lewis (1994), and more recently Facchini and Willmann (1999), analyze non-linear taxation.

[17] It is tempting to think that this usually first-best policy instrument allows us to concentrate on the strategic effect and abstract from other possible distortions, but proposition 3 will qualify this argument.

[18] See Cordella and Ventura (1992) for counter examples to Pareto gains where this order is reversed in an otherwise static setting. Having the government move first seems more natural to us. After all, most readers will have filled out tax forms and helplessly faced high, *given* tax rates which for the most part had been in effect for years.

the initial redistribution has taken place. The compensation scheme thus amounts to a simple redistribution of the first-period endowments before the agents make any decisions.

In what follows we determine the lump-sum transfers which guarantee all agents their autarkic utility level. The sum of these transfers across all agents should be negative. In other words, the scheme should not require any positive transfer from the government. Only if this is the case will the scheme be feasible and can a potential budget surplus be used to attain strict Pareto gains.

With lump-sum transfers in the first period the indirect utility function takes the form $V(p,w) = (1+t)\mathcal{B}p^{-\beta}$ for unskilled agents and $V(p,w) = (a+t)\mathcal{B}p^{-\beta}w$ for those who become skilled, where t is the net transfer payment the individual agent receives. This results in a critical ability level of $a_c^*(t) = (1 - t(w^* - 1))/w^*$ under free trade. The critical ability level under autarky is the same as before, $a_c^A = 1/w^A$, since no transfers are needed.

As before this leads us to distinguish three groups. For the low-ability agents who do not become skilled either under autarky or under free trade, equating $\mathcal{B}(p^A)^{-\beta} = (1+t)\mathcal{B}(p^*)^{-\beta}$ yields a required transfer of $t = b^\beta - 1$ per agent. The transfer leads to a modified critical ability level and the low-ability group now comprises all $a \in [0, (1-(b^\beta-1)(w^*-1))/w^*)$. The medium-ability group then consists of all $a \in [(1-(b^\beta-1)(w^*-1))/w^*, 1/w^A)$, and equating $\mathcal{B}(p^A)^{-\beta} = (a+t)\mathcal{B}(p^*)^{-\beta}w^*$ yields a transfer of $t = b^{\beta-1/\alpha}/w^A - a$ for each of them. The high-ability group, finally, is made up of all agents $a \in [1/w^A, 1]$, and equating $a\mathcal{B}(p^A)^{-\beta}w^A = (a+t)\mathcal{B}(p^*)^{-\beta}w^*$ yields a transfer of $t = a(b^{\beta-1/\alpha} - 1)$ per capita. Summing over all the agents in each group gives

$$\begin{aligned} T_1 &= (b^\beta - 1)(1 - (b^\beta - 1)(w^* - 1))/w^* \\ T_2 &= \int_{(1-(b^\beta-1)(w^*-1))/w^*}^{1/w^A} (b^{\beta-1/\alpha}/w^A - a)da \\ T_3 &= \int_{1/w^A}^{1} a(b^{\beta-1/\alpha} - 1)da \end{aligned}$$

which can be written as

$$T = \sum T_i = -0.5(b^{\beta-1/\alpha} - 1) + 0.5(b^{\beta-1/\alpha} - 1)/(w^A)^2$$

$$-0.5((b^{\beta} - 1) - b^{\beta-1/\alpha}/w^A)^2 + 0.5b^{\beta-1/\alpha}/(w^A)^2 - 0.5/(w^A)^2$$

Since this sum is clearly negative we see that the redistribution scheme is not only feasible but actually produces a positive surplus that can be distributed in order to make some or even all agents strictly better off.[19] We conclude that Pareto gains from trade are possible in our model when the government uses redistributive policies only in the first period and credibly commits itself not to intervene thereafter. This conclusion is not surprising since then our model represents an Arrow–Debreu economy. We have shown the standard small-country Pareto gains from trade result in the context of our model. Note that the analysis above did not involve the actual value for the autarky skilled wage w^A. Thus the analysis also applies to moves from restricted to free trade.

4.7 Redistribution after the Reform

Let us now turn to the case where the government is free to redistribute after the reform has been enacted — in the wake of trade liberalization so to speak. For simplicity we abstract from first-period redistribution in this section.[20] The government's objective is to guarantee Pareto gains in the second period and it does not consider any prior effects. This might seem somewhat arbitrary and artificial in our two-period setup. The reader is reminded, however, that the simple model under consideration here abstracts from a more explicit time dimension. In such a richer dynamic context, the above assumption amounts to the government pursuing the optimal policy path

[19] For a detailed discussion of whether and how this is possible, see the exchange between Kemp and Wan (1986) and Dixit and Norman (1986), and also the less heated discussion in Hammond and Sempere (1995). Note that in the case of a small country with factor price equalization redistributing the surplus does not change the price vector.

[20] Adding that complication would only mean considering a slightly different model economy — the difference being the distribution of physical endowments in the first period. The strategic effect to be discussed below would remain.

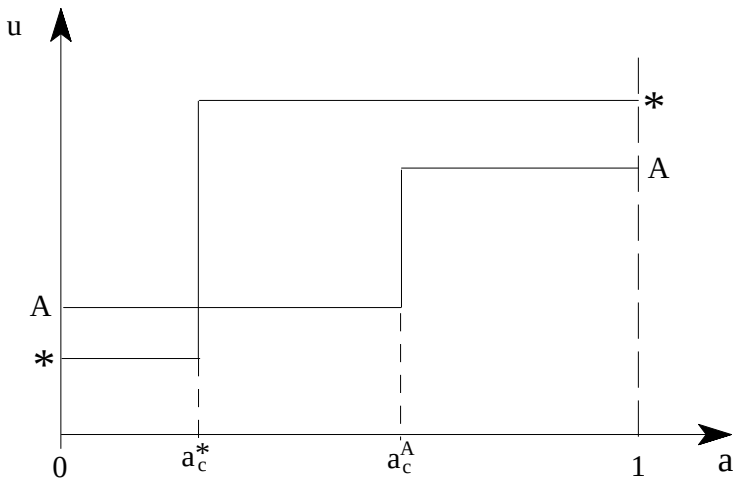

Figure 4.2: Distribution in the second period

from a given point in time forward.

Figure 4.2 shows the distributional effects of trade liberalization in the second period. Free trade affects the three groups differently — exactly the same as the groups in our discussion of figure 4.1. As before, the high (low) ability group experiences a welfare increase (decrease) due to the respective change in second-period real income. This similarity of intertemporal and second-period distributional effects reflects the fact that neither group alters its behavior in period one. The picture looks dramatically different for the third (medium-ability) group whose members change their decisions in the first period. This group enjoys the most pronounced welfare increase in the second period.

Given its objective, the government will try to compensate the losers. To finance these payments it will turn to those agents who gain from trade. But people anticipate this intervention. Those who would have been willing to invest in human capital in the absence of a compensation scheme could now act strategically. Instead of giving up part of their first-period endowment only to see the returns in the second period appropriated by the government, they could keep their endowment and count on the government to prevent them from experiencing a loss of utility in period two.

The government wants to avoid such decision reversals because they involve transfer payments to agents from whom it could otherwise raise revenue. In order to keep skill acquisition profitable it has to lower the individual taxes it demands. This incentive constraint is the driving force behind the following proposition.

Proposition 1 *In general dynamic models, it may be impossible after trade liberalization to achieve Pareto gains from trade by means of lump-sum redistribution.*

Proof: Consider our model with parameter values $\beta = 4/5$, $\alpha = 5/6$, and $b = 2$ as an example. The implied autarky wage is 2. Those agents who do not become skilled in autarky require a transfer of $t = b^\beta - 1$ per person in order to attain their autarkic utility level under free trade if they decline to become skilled. If they are to change their decision and become skilled under free trade, the least they have to receive to avoid having their intertemporal utility with compensation $a\mathcal{B}(p^*)^{-\beta}(w^* + t)$ fall short of the autarky level $\mathcal{B}(p^A)^{-\beta}$ is $t = b^\beta/a - b^{1/\alpha}w^*$. The critical ability level $\hat{a}_c = b^\beta/(b^\beta - 1 + b^{1/\alpha}w^A)$ minimizes compensation payments. The government will pay $b^\beta - 1$ to all $a \in [0, \hat{a}_c)$, a total of $(b^\beta - 1)\hat{a}_c \approx 0.24$, and pays the net amount of $b^\beta/a - b^{1/\alpha}w^*$ to all $a \in [\hat{a}_c, 1/w^A)$, a total of $b^\beta \ln(1/w^A) - b^{1/\alpha} - b^\beta \ln \hat{a}_c + b^{1/\alpha}w^A\hat{a}_c \approx -0.06$ for this group. For those agents who acquire skills in autarky, the smallest net amount they need to be paid is $t = b^\beta w^A/a - w^*$ per person. Total net compensation payments for this group are $-b^{1/\alpha}(w^A - 1) - b^\beta w^A \ln(1/w^A) \approx 0.12$. Summing up, this redistribution scheme is seen to be infeasible because it would involve paying out a positive amount. □

A counter example — although it constitutes a valid proof — raises the question of robustness. In our model, the above result is indeed robust with respect to changes in the production technology (parameter α) and in preferences (parameter β).[21] The crucial variable is b which, loosely speaking, measures the scope for gains from trade. Intuitively, if b is high — i.e., if there are abundant gains from trade — then the

[21] We chose the above values of α and β solely because they conveniently result in an integer value for the autarky equilibrium wage.

crit. b		β								
		.1	.2	.3	.4	.5	.6	.7	.8	.9
	.1	1.001	1.002	1.003	1.004	1.005	1.006	1.007	1.008	1.009
	.2	1.004	1.008	1.012	1.015	1.019	1.023	1.027	1.031	1.035
	.3	1.009	1.017	1.026	1.035	1.044	1.053	1.062	1.072	1.082
	.4	1.016	1.031	1.046	1.063	1.079	1.097	1.116	1.138	1.162
α	.5	1.024	1.049	1.074	1.100	1.129	1.161	1.198	1.241	1.294
	.6	1.035	1.071	1.108	1.149	1.196	1.252	1.321	1.409	1.528
	.7	1.048	1.097	1.151	1.213	1.288	1.384	1.514	1.702	2.003
	.8	1.063	1.129	1.204	1.295	1.413	1.580	1.837	2.285	3.247
	.9	1.080	1.166	1.268	1.401	1.590	1.889	2.443	3.762	9.121

Table 4.1: Critical values of b

incentive constraint will not prevent us from obtaining Pareto gains through lump-sum redistribution. Whereas if b is low, the constraint renders Pareto gains unachievable.

Table 4.1 gives critical values for b across the parameter space of α and β. At these critical values, the individual lump-sum transfers involved in keeping agents at their autarkic utility levels sum to zero — that is, the redistribution scheme produces neither a surplus nor a deficit. If the ratio of world market to autarky price is greater than the critical value for a given (α, β), the government runs a surplus — which it can then use to achieve a strict Pareto improvement. If, on the other hand, the ratio is less than the critical value, then redistribution would require a deficit and Pareto gains are unachievable. Note, though, that if b lies below its critical value the strategic effect is still present even if it does not dominate.

We see from table 4.1 that the critical value of b is increasing in both parameters. Since an increase in α and β corresponds to a larger high-tech sector, this means that the strategic problem becomes more severe the more important the high-tech sector. The range of values in table 4.1 translates into price changes in the order of one in a thousand to a factor of nine. Given that industries in industrialized countries grow ever more skill-intensive and that reforms enacted by the GATT and WTO make it likely that further trade liberalization will entail smaller price changes, the striking

case established in our proposition seems to be more than a theoretical possibility.[22]

4.8 Remedial Policies

After establishing the negative result of the previous section, let us now discuss possible remedies. Crucial in this context is the question of whether the agents' ability levels are public knowledge. Maintaining the assumption of complete information used so far, we first consider the case where the government knows each agent's ability. Given this assumption we can establish the following:

Proposition 2 *There exist a set of ability-dependent, first-period taxes and subsidies on human capital acquisition $t_1(a,s), t_1(a,u)$ and a set of second-period, lump-sum transfers $t_2(a)$ that lead to a Pareto improvement over autarky.*

Proof: Let

$$t_1(a,u) = \begin{cases} 0 \\ -a \end{cases} \quad \text{and} \quad t_1(a,s) = \begin{cases} -a & \text{for} \quad a \leq 1/w^A \\ 0 & \text{for} \quad a > 1/w^A \end{cases}$$

On the equilibrium path agents then make the same human capital decisions as under autarky. Note that financing of this part of the scheme is feasible by construction. In the second period, let $t_2(a) = b^\beta - 1 \ \forall \ a \leq 1/w^A$ and $t_2(a) = (b^\beta - b^{1/\alpha})w^A \ \forall \ a > 1/w^A$. That is, the unskilled receive compensation, the skilled pay, and everyone attains the same second-period utility as under autarky. The cost of this second part of the scheme across all agents amounts to

$$T_2 = (b^\beta - 1)/w^A + (b^\beta - b^{1/\alpha})(w^A - 1)$$

which — using the equilibrium autarky wage — can be rewritten as

$$T_2 = \frac{\beta}{w^A(1-\alpha\beta)} \left(\frac{b^\beta - 1}{\beta} - \frac{b^{1/\alpha} - 1}{1/\alpha} \right) < 0 \tag{4.7}$$

[22] This is an empirical question which awaits further investigation.

The inequality follows from the fact that $f(x) = (b^x - 1)/x$ is strictly increasing on $\Re_+$ and $1/\alpha > \beta > 0$. The scheme thus produces a budget surplus that can be used to achieve a strict Pareto improvement. □

Supplementing second-period transfers with first-period investment directives allows us to recover Pareto gains. We speak of directives because the government, armed with complete information, practically dictates the human capital decision. It does so by imposing punitive taxes off the equilibrium path that dissuade agents from acting strategically. Thus avoiding detrimental strategic investment behavior, Pareto gains from trade can be achieved through lump-sum redistribution in the second period.

Admittedly, the assumption of complete information is strong. It seemed justified when establishing the counter example of the previous section because — in that context — giving the government complete information along with a usually first-best policy instrument seemed to put the hurdle as high as possible.[23] In the context of remedial policies and positive results, however, public knowledge of individual ability levels is unrealistic and we now turn to the case where this information is private. Note that without this knowledge the government is no longer able to carry out lump-sum redistribution, so we follow the static literature in considering Diamond–Mirrlees style commodity taxation as proposed in Dixit and Norman (1980).

Proposition 3 *There exists a set of second-period commodity taxes and subsidies that lead to a Pareto improvement over autarky.*

Proof: Let consumers receive a subsidy of $(b-1)p^A$ for every unit of the high-tech good they purchase and pay a tax of $(b^{1/\alpha} - 1)w^A$ on their wage from skilled labor so that they face the same price vector as under autarky. Without a price change they do not change their decisions, that is aggregate demand for the high-tech good and the supply of skilled labor are the same as they were under autarky (cf. equations 4.3

[23] Note that proposition 3 will show this argument to be fallacious.

and 4.2). The net cost to the government of operating this scheme amounts to

$$T_2 = (b-1)\beta(w^A - 1 + 1/w^A) - (b^{1/\alpha} - 1)(w^A - 1)$$

which can be rewritten as

$$T_2 = \frac{\beta}{w^A(1-\alpha\beta)}\left((b-1) - \frac{b^{1/\alpha}-1}{1/\alpha}\right) < 0 \tag{4.8}$$

The inequality again follows from the fact that $f(x) = (b^x - 1)/x$ is strictly increasing on $\Re_+$ and $1/\alpha > 1 > 0$. The scheme thus produces a budget surplus that can be used to achieve a strict Pareto improvement. □

We see that carefully chosen commodity taxation that keeps consumer prices at their autarkic level also avoids strategic reactions. Comparing expressions 4.7 and 4.8 reveals, however, that the budget surplus under the latter scheme is lower. In other words, the government cannot achieve strict Pareto gains to the same extent as above. We therefore obtain the Pareto ordering depicted in figure 4.3.[24]

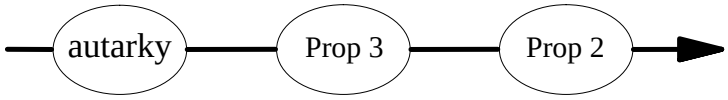

Figure 4.3: Pareto ordering

The relative position of the two regimes discussed in this section reflects their different informational requirements. Although informationally less demanding, the Dixit-Norman approach suffers from shortcomings of its own. Completely freezing

[24]Looking at this figure, the reader might wonder where the regime of proposition 1 would fit in. How that regime compares to autarky was already discussed. Its position relative to that of proposition 3 is equally ambiguous. All depends on how the negative strategic effect compares to the efficiency gains on the consumption side, both present in proposition 1 but not proposition 3. We do know, on the other hand, that it must be dominated by the regime of proposition 2 since both allow for static efficiency gains in production as well as consumption and the only relevant difference is the negative strategic effect.

consumer prices is probably too much to ask for from even the most competent bureaucracy. In addition, it would be hard to enforce different producer and consumer prices for production units, such as farms, that also consume part of their output.

At a more theoretical level, both remedial policies presented above are time consistent. Upon entering the second period, the government sees no need to reoptimize since the original provisions already guarantee Pareto gains with respect to second-period utility. But time consistency is not sufficient for optimality.[25] Foregoing dynamic gains from trade — as both schemes do — suggests that neither is Pareto optimal. To see why the first scheme is not Pareto optimal, consider those agents who change their decision (from staying unskilled to becoming skilled) as we move from autarky to free trade without compensation. The first scheme above forces these agents to stay unskilled. But the government could just as well force them to become skilled and would not even have to pay them any compensation in the second period because their lifetime, as well as their second-period utility, increases. As for the private information case, the fact that Dixit–Norman taxation is not even second-best can be shown along the lines of Facchini and Willmann (1999) — that is, by allowing the potential top winners to opt out of the tax scheme and pay a fee for entering a duty-free zone.[26]

4.9 Concluding remarks

Is redistribution a help or a hindrance? That is the question posed in the title. Throughout the paper we have focused on exploring how and to what extent redistribution can be a hindrance — an issue that only arises in the dynamic context. We show how the redistributive measures one might use to avoid the adverse effects of trade liberalization can provoke strategic reactions on the part of the agents. Knowing that they will be compensated, or will have to pay compensation, leads them to underinvest prior to the reform. We establish that this strategic underinvestment

[25] Kydland and Prescott (1977) make this point and the formal insufficiency result in Tesfatsion (1986) extends to the more general heterogeneous agents case.

[26] This is a special case of non-linear taxation that, presumably, is not second-best either.

can wipe out the gains from trade. There is a critical level of potential gains from trade above which gains dominate and Pareto gains are possible, while below that level the strategic effect dominates and Pareto gains are impossible. We show how using ability-dependent taxes and subsidies on human capital acquisition before the reform remedies the problem. Even when ability levels are private information, Dixit–Norman commodity taxation can be used to achieve Pareto gains. The conclusion we draw from our findings is that extending the static Pareto gains from trade result to the dynamic context requires careful analysis. Redistribution can be a hindrance as well as a help.

The remedial policies discussed in this paper are only meant as a starting point. Both schemes we discuss are time consistent but not optimal. We feel that the search for optimal policies should be conducted in richer models with a more explicit time dimension and leave this for future research. In addition, we would like to endogenize the government's objectives in a more explicit, political economy framework. Voting on a higher dimensional policy space including trade and redistribution could potentially lead to interesting results. Especially in the dynamic context, the possibility arises that voters first embark on trade liberalization, then vote for redistribution, and in the end find themselves worse off. Finally, the empirical relevance of the strategic effect analyzed in this paper remains to be investigated.

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