

# The brander-krugman model



**Extended Essay 1**

The Brander-Krugman model, also known as the reciprocal dumping model, explains the possibility of international trade in a homogenous good. In doing so, it raises an interesting issue: is this apparently pointless trade socially beneficial? Meanwhile, Corden developed a more realistic customs union (CU) theory compared to orthodox theory by relaxing the assumption of constant marginal costs (MC). While the framework of these two models are similar, their conclusions are very different, the reasons for which are discussed further below.

a)

Both models are set in a partial equilibrium framework; the prices of all substitutes and complements of the good in question are assumed to be constant, as are the income levels of consumers, allowing for an easier analysis of welfare gains from the formation of the customs union (CU).

Within this framework, there is a single producer in each of the CU countries that produces a homogenous good. The other similarity between the two models is that the tariffs set and faced by both countries (Home (H) and Partner (P)) before CU formation are equal. Thus, when the union is created a Common External Tariff (CET) already exists. Corden develops his model in further stages to include made-to-measure tariffs so that the CET has to be set upon CU formation. It is assumed that this will be set lower than the original tariffs that were imposed.

The countries forming a CU in Corden's model are small relative to the rest of the world (R), implying that its formation will have no effect on world

prices. In the Brander-Krugman model, all three countries (R is represented as one country) are identical in size.

Symmetry is assumed between the firms in the Brander-Krugman model therefore the firms in each of the countries face the same constant marginal cost and domestic demand functions, contrary to Corden.

Corden relaxes the assumption of constant marginal costs (MC) that is held in orthodox customs union theory, and assumes instead that the firms benefit from internal economies of scale and thus face declining marginal and average cost (AC) curves. Figure 1 shows that the minimum point of the firms' AC curves is above the price paid for imports ( $p_m$ ). Hence a tariff is necessary to protect domestic production, which is set at  $T - p_m$  and prevents R from importing to H and P. The domestic price being equal to the firms' AC, they operate at a normal profit. The price received for exports ( $p_x$ ) is assumed to be lower than  $p_m$  as H and P also face tariffs. Therefore, their AC is greater than  $p_x$  and so they cannot export their goods either. Thus, unlike in the Brander-Krugman model, there is no international trade prior to CU formation.

The main characteristic of the Brander-Krugman model is that the firms display Cournot behaviour – the firms make decisions about their own output levels to maximise their profits assuming that the output levels of the other producers will not change[1]. This is not necessarily the case in Corden's model.

b)

The existence of internal economies of scale in Corden means that efficiency and welfare gains could be increased if a single firm increases its output and captures both markets following CU formation. This, along with the assumption that the firms face different cost functions, leads to the conclusion that the firm with the higher AC will exit the market and import the good from the firm that can produce it at a lower cost (this essay will assume that the partner firm exits the market). The assumption that the partner firm operated at a normal profit pre-CU indicates that there will be no loss of producer surplus and no welfare loss in P as it exits the market.

Conversely, the symmetry between the firms in Cournot means that neither firm in the CU has a cost advantage over the other. Thus, both the home and partner countries benefit from CU formation by increasing trade with each other, resulting in an increase in output for both firms (Appendix, equation (1)). Although H and P have increased their overall output, the quantity they supply in each of their domestic markets decreases (equation 2).

Although there is an overall gain in welfare in both models as a result of CU formation, the source of these gains differ. Both the home and partner countries experience a welfare gain from CU formation in Cournot given the symmetry, whereas only the home country benefits in Corden as the partner firm exits the market.

In Cournot, the price falls in the markets (equation 3) and thus the welfare gain is largely reflected by an increase in consumer surplus (equation 4) in both the home and partner markets. The countries also lose welfare through a fall in tariff revenue (equation 5) and the firms' profits may rise or fall

depending on the elasticity of the aggregate demand in the CU (equation 6). However, H's overall welfare gain is shown to be always positive (equation 7).

In Corden, the assumption that the home and partner countries are small compared to the rest of the world implies that the CU firms are not large enough to compete with the outside firm and therefore the CU formation will not affect world prices. This, along with the assumption that the remaining firm within the CU maximises his profit by charging right up to the 'import-preventing' price, which is the world price plus the CET, means that the price will remain unchanged. Thus, the increased welfare is due to an increase in the remaining firm's producer surplus (figure 1,  $a+\beta$ ) as the fall in average cost (to J, figure 1) is not passed onto consumers. However, if made-to-measure tariffs are assumed and the CET is lower than both the initial tariffs, a price reduction will be induced in both countries and some of the welfare gain will be passed onto consumers.

The symmetry in Cournot and differentiation in Corden also lead to different conclusions with respect to the impact on the rest of the world.

In Corden, the CU formation does not affect R's welfare under the assumption that there was no international trade pre-CU and there is still none post-CU. In Cournot, the fall in R's output (equation 8) and the price drop in H and P impact negatively on the R firm's profits (equation 9). As consumption and imports in R remain unchanged, R's welfare is reduced.

The main assumptions that lead to the different conclusions are those of symmetrical costs in Cournot and differentiation in Corden. This affects how

the welfare gains are divided amongst the countries as well as how they are split between the producers and consumers.

c)

In discussing the appropriateness of the models to the EU situation, the relevance of the assumptions and the predicted results, and how the causes of these results compare with reality need to be considered.

There are many studies that analyse how EU integration has affected trade flows in terms of trade creation and trade diversion. Trade creation is defined as intra-EU imports replacing domestic production; trade diversion as EU imports replacing imports from the rest of the world.

By 1992, bilateral trade between any two EC countries was 65% higher than if the EC had not existed, supporting both models' predictions that trade between the home and partner countries increases.[2] Over the period from 1959/60 to 1977, which includes both stages of integration for the EC and EFTA countries, annual trade creation was estimated at \$20-31 billion and trade diversion at \$5-8 billion.[3] This affirms the Cournot prediction that the partner firm would increase its imports to the home country at the expense of both domestic production and imports from the rest of the world.

A study by the Single Market Review on the impact of the Single Market Programme (SMP) on trade creation and trade diversion gives a detailed insight into the relevance of the Corden and Cournot models to the EU situation.[4] Its data and analysis focuses on industries within the

manufacturing sector, particularly the 15 industries that were likely to be particularly sensitive to the SMP.[5]

Although there are some industries close to perfect competition with a concentration ratio of 0.00 or 0.01 – such as clothing and boiler making – most industries within the EU are relatively oligopolistic according to their average concentration ratios.

The assumption of perfect information is unlikely to hold true. In many economic theories where this is assumed, it is highly unrealistic, especially with regards to the reactions of a firm's competitors to the union formation.

While Cournot assumes that firms face a constant MC, a 50% reduction in output from the minimum efficient scale of output led to an increase in AC, and therefore MC, in all the industries analysed, thus indicating the presence of economies of scale.

The assumption that all firms display Cournot behaviour does not always hold in the context of the EU. Through a comparison of the changes in the price-cost margins and in the home firm's market share in the domestic industry, it is evident that industries reacted in two very different ways. One group, including office machines and pharmaceutical products, experienced large cuts in their price-cost margins and a relatively small change in their market share, while the opposite is the case for the other group. It appears that the first group decided to reduce its prices instead of losing market share, implying that some firms do not compete on output but on price.

However, the effect of changes in competitive behaviour by firms on market shares was extremely small for most industries and countries, though it was

usually more important in the smaller EU countries.[6] Thus, changes in firms' behaviour are relatively insignificant in affecting market shares, compared to other factors.

The assumption of symmetrical firms is, again, an unrealistic one. Given that the country sizes within the EU are very different, it is highly likely that firms across the EU faced different market sizes and domestic demand functions before integration, and as a result, they are unlikely to be the same size or have the same cost functions.

In terms of the impact of the CU formation on the industries, most of the results predicted in Cournot hold true from 1900-94, the period examined in this SMR report.

The price-cost margins in the 15 'sensitive' industries fell by an average of 3.9%, while they fell by 3.6% in the manufacturing sector as a whole. The extent of this drop in each industry depends on the behaviour of the firms.

The impact of the SMP on the respective market shares in the manufacturing sector as a whole is negative for the home industries, and positive for both the EU and the rest of the world's market shares in the home country.

Cournot's model correctly predicted that the home firm would sell more while the partner firm would sell less in the home market. However, it predicts that the rest of the world's share of the home market would fall. The SMR carried out two ex-post simulations; one with no direct external trade effects and one with. All of Cournot's predictions regarding changes in the market shares hold true for the former simulation. However, the latter simulation is more accurate in reflecting the actual changes in market shares



that were experienced over this integration period. This implies that the Cournot model does not take into account the increasing liberalisation of external trade over this period that also led to a reduction in extra-EU trade costs, either as a result of the CU formation or due to increasing globalisation.

In terms of welfare, the changes support Cournot's prediction that welfare increased in both H and P. The change in welfare measured as a percentage of GDP was greater than the percentage change in GDP in each of the EU countries analysed.

The main goal of creating the single market in the EU was to increase its competitiveness with respect to large economies such as the USA through economies of scale. This implies that Corden's model should offer a more accurate picture of the EU. However, certain assumptions do not reflect the EU's characteristics.

The assumption that the CU-forming countries are small may hold true for some of the EU countries; however, the implication of this that the customs union will be unable to affect world prices may not hold. Given the size of the EU, it is large enough to compete with the large economies such as the USA and Japan.

Corden's predictions regarding changes in price and market shares are not appropriate to the EU situation, due to the strong assumptions that there was no international trade prior to the formation and thus no trade with the rest of the world after. Also, with the partner firm exiting the market, it is

assumed that there is no increase in competition following CU formation, thus no change in the prices.

However, there is evidence supporting the main conclusion of this model that the welfare gain is a result of restructuring, which leads to increasingly concentrated industries as firms can benefit from economies of scale as the size of the market that they have access to increases. Between 1987 and 1993, the four-firm concentration ratio increased by 2. 3% across 71 industries in the EU.[7] This was partly due to increased restructuring; between 1987 and 1990, the percentage of M&As involving countries from two different member states jumped from 9. 6% to 21. 5% in anticipation of the Single Market. This replaced M&As within country borders which fell from 71. 6% to 60. 7% over the same period.[8]

While it is true that EU industry concentration has increased, this is cannot be attributed solely to an expansion in the market size. Many industries already operated internationally in the 1980s and hence, a market size expansion would not have had as big an impact on the concentration level. The single market also led to a reduction in non-tariff barriers (especially barriers to entry) between EU member states, through public procurement liberalisation, increased ease of cross-border knowledge transfer and the free movement of capital. Corden's comparative static model fails to take into account the dynamic effects of EU integration.

The aim of the SMP was much more ambitious than a mere elimination of the tariff barriers and thus both theories, which focus on the effects of a CU, are too simplistic to be wholly appropriate. Certain aspects of both models are

comparable to the EU situation. However, Corden's model seems to be more suitable; while Cournot's results regarding changes in the prices and respective market share were more accurate, Corden's underlying characteristics are much more appropriate to the current EU situation.

1

1. Friedman, James (1983), ' Oligopoly Theory', Cambridge University Press
2. Frankel (1997) (Ali El-Agraa P175)
3. Kreinin (1979b) (Ali El-Agraa P175)
4. European Commission/CEPR (1997) Trade Creation and Trade Diversion, Subseries IV/ volume 3 of The Single Market Review
5. Buigues, Ilzkovitz and Lebrun (1990)
6. EC/CEPR, 1997, Trade creation and trade diversion
7. Subseries V, Volume 4, Economies of Scale
8. AMDATA in European Economy (1999)