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Competitive versus Comparative Advantage

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COMPETITIVE VERSUS COMPARATIVE ADVANTAGE*

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Abstract

I explore the interactions between comparative, competitive and absolute advantage in a two-country model of oligopoly in general equilibrium. Comparative advantage always determines the direction of trade, but both competitive and absolute advantage affect resource allocation, trade patterns and trade volumes. Competitive advantage in the sense of more home firms drives foreign firms out of marginal sectors but also makes some marginal home sectors uncompetitive. Absolute advantage in the sense of a uniform fall in home costs tends to raise home output in all sectors but also leads both countries to specialise less in accordance with comparative advantage.

JEL: F10, F12

Keywords: Comparative and absolute advantage; comparative and competitive advantage; exchange-rate protection; GOLE (General Oligopolistic Equilibrium); market integration.

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1. INTRODUCTION

Comparative advantage is widely believed by economists to be a key determinant of international production and trade patterns. But non-economists typically think otherwise. In business schools and business circles much greater emphasis is placed on the role of competitive advantage as a predictor of the economic fortunes not just of firms, but of nations as a whole.

What exactly is competitive advantage? And how, if at all, does it relate to and interact with comparative advantage? One possible answer is that it is something to do with more competitive markets: lower barriers to entry or simply a larger number of firms may give an industry an advantage in competing with foreign rivals. A different answer is that competitive advantage is just a synonym for absolute advantage: some natural or policy-induced superiority (such as lower taxes or greater labour-market flexibility) which reduces costs for all home sectors.

Developing a theoretical framework which can cope with these issues poses formidable analytic challenges. Standard competitive models of international trade are inadequate for this task. They do not allow for changes in the degree of competition in the economy. And they imply that an improvement in absolute advantage, in the sense of an economy-wide fall in production costs in all sectors, will show up in higher real income for the home economy but will have little or no effect on resource allocation or trade patterns. As for the models of the so-called "new" trade theory (an increasingly inappropriate label since it dates from the early 1980s), which added product differentiation and increasing returns to the list of determinants of trade patterns, they are not adequate either. One reason is that the new trade theory explanation of trade stresses similarities between countries rather than differences, whereas it is clear that both competitive and absolute advantage, whatever they mean, concern international differences. A second drawback is that new trade theory relies almost completely on monopolistic competition to explain intra-industry trade.[1] I have argued elsewhere that such models represent rather little advance in descriptive realism over perfectly competitive models.[2] In the present context, they cannot be used to operationalise the concept of competitive advantage.

A different approach to understanding competitive advantage, exemplified by Porter (1990), is to use case-study evidence to identify the factors which encourage a nation's firms to achieve high world-market shares in their industries. For the most part, economists have either ignored Porter's approach or dismissed it as merely a restatement of comparative advantage. (See Warr (1994).) Yet, through its emphasis on the ways in which factor productivity and firm competition interact, it poses a challenge to develop a theoretical framework which encompasses them both, a challenge which traditional models cannot meet.

In this paper I draw on a model of oligopoly in general equilibrium which I present in detail elsewhere, Neary (2002c), to address these issues. The key to this model is that firms are assumed to be "large" in their own sectors, so they exert market power and behave strategically against their rivals; but to be "small" in the economy as a whole, so they take factor prices and national income as given in making their decisions. Sections 2 to 4 give a self-contained presentation of the model, while Sections 5 and 6 consider its implications for the interactions between comparative, competitive and absolute advantage.

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[1] An exception is the work of Brander (1981), which shows how oligopolistic competition can lead to two-way trade in a single sector. The model has been extended by Weinstein (1992) and Yomogida (2001), who show that an increase in the number of home firms raises exports. The model of this paper can be viewed as an extension of Brander's to general equilibrium.

[2] See Neary (2001, 2002a, 2002b).

2. PRODUCTION PATTERNS IN INTERNATIONAL OLIGOPOLY

I begin with the determination of equilibrium in a single international oligopolistic industry. From the partial equilibrium perspective of firms in the industry, the inverse demand function is linear, and can be written as:

$$p \quad = \quad a' - b'\bar{x} \tag{1}$$

Here a' and b' are parameters, which vary in general equilibrium, but which are taken as given by firms; while $\bar{x}$ denotes total sales to both home and foreign consumers. I assume a given number n of home firms, all of which have the same marginal cost c, so all home firms have the same equilibrium output, denoted by y. Similarly, there is a given number n^* of foreign firms, all with the same marginal cost c^* and the same equilibrium output y^*. Total sales equal the sum of total production by home and foreign firms: $\bar{x} = ny + n^*y^*$. Finally, I assume that there are no transport costs or other barriers to international trade, and that firms view the world market as a fully integrated one.

Assume that firms are Cournot competitors, choosing their outputs on the assumption that their rivals will keep theirs fixed. Calculating equilibrium outputs and prices in this relatively simple oligopoly model is straightforward.[3] To illustrate the implications for whether home firms produce positive levels of output, consider Figure 1. This is drawn in the space of home and foreign marginal costs, c and c^*, assuming given values of n and n^*.

Suppose first that foreign firms do not produce. The output of a typical home firm is then:

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[3] The first-order condition for a typical home firm is: $p - c = b'y$. Using (1) to eliminate p gives the firm's reaction function. With no active foreign firms, this can be solved directly for (2). If foreign firms are active, then their reaction function must also be calculated and solved jointly with that for home firms to give (3).

$$y = \frac{a' - c}{b'(n+1)} \qquad \textbf{(2)}$$

Hence, since operating profits are proportional to output, home firms are profitable provided c is below a'.[4] The threshold locus in this case is the horizontal line labelled (2) in Figure 1. Now suppose instead that all n^* foreign firms produce at a positive output level. The output of a typical home firm is then:

$$y = \frac{a' - (n^*+1)c + n^* c^*}{b'(n + n^* + 1)} \qquad \textbf{(3)}$$

In this case, home firms are unprofitable unless c is below $(a'+n^*c^*)/(n^*+1)$. This defines a second threshold locus, the upward-sloping line denoted (3) in Figure 1. Now combine the two loci to deduce the potential for profitable home production. Clearly at points above both loci, such as *I*, home firms have high costs and face efficient rivals; hence they are never profitable. At points such as *II*, home firms would be profitable if foreign firms did not produce; but foreign firms have low costs and so will produce, driving home firms out of the market. Finally, at points such as *III*, home firms would be profitable if foreign firms *did* produce; but since foreign firms have high costs they will not produce, so home firms too are unprofitable. The implication of all this is that home firms are profitable only at points such as *IV* in the region below the two loci.

Combining these conditions with similar restrictions on the foreign firms, the possible equilibria are illustrated in Figure 2. If both home and foreign marginal costs exceed a', in the region denoted "*O*", then no firms serve the market. Otherwise the market may be served by firms from one or both countries, depending on the configuration of marginal costs.

[4] From the first-order condition in the previous footnote, operating profits $(p-c)y$ equal $b'y^2$. We ignore fixed costs for simplicity.

Inspecting the diagram shows that the size of the *HF* region, in which both home and foreign firms are viable, contracts as the number of firms in either country rises. In the competitive limit, when both n and n^* approach infinity, the region collapses to the 45 line.

The effects on home production of changes in costs and in the number of competitors are easily seen from (2) and (3). Higher home costs always lower the output of home firms; and the same is true of lower foreign costs, whenever there are foreign firms competing in the sector. A greater number of home firms lowers the output of each, but raises total home output in the sector. In addition, an increase in the number of home firms drives foreign firms out of business in some marginal sectors: in Figure 2, the *H* region expands at the expense of the *HF* region. Similarly, an increase in the number of foreign firms reduces the output of home firms in all sectors where they continue to compete, and also squeezes out some home sectors, expanding the *F* region at the expense of the *HF* region.

3. LINKING FACTOR AND GOODS MARKETS

Figure 2 allows for arbitrary cost parameters at home and abroad. In general equilibrium, we need to specify how costs are determined. In this paper I assume a simple Ricardian cost structure with a large number, strictly speaking a continuum, of sectors. Let the index "z" denote a typical sector, where z varies from zero to one. Each sector requires a fixed labour input per unit output, denoted $\alpha(z)$ and $\alpha^*(z)$ in the home and foreign countries respectively. Hence the marginal costs in the previous section depend on technology, represented by the labour input coefficients $\alpha(z)$ and $\alpha^*(z)$, and on the wage rates in both countries, w and w^*:

$$c(z) = w\alpha(z), \qquad c^*(z) = w^*\alpha^*(z) \tag{4}$$

As in Dornbusch, Fischer and Samuelson (1977), I assume that sectors can be ranked unambiguously in terms of their unit labour requirements. In this paper I concentrate on a convenient special case where the unit labour requirements in both countries vary linearly with z.[5] Suppose (without loss of generality) that the home country is more efficient in producing goods with low values of z. Then the unit labour requirements can be written as follows:

$$\alpha(z) \;=\; \alpha_0 + z \qquad \text{and} \qquad \alpha^*(z) \;=\; \alpha_0^* + 1 - z \tag{5}$$

Figure 3 illustrates. The case where α_0=α_0^* is one of "pure" or symmetric comparative advantage. Increases in α_0 correspond to a loss of absolute advantage for the home country.

In a competitive model, at most one sector can operate in both countries in equilibrium, corresponding to the knife-edge case where $c(z)=c^*(z)$. In oligopoly, by contrast, high-cost firms are not necessarily driven out of business. Figure 4 illustrates a possible configuration of costs. This figure is identical to Figure 2, except for the downward-sloping line, which indicates how home and foreign costs vary across sectors. In the case shown, there are two threshold sectors, $\tilde{z}$ and $\tilde{z}^*$. All sectors for which z is less than $\tilde{z}$ are competitive in the home country, while all sectors for which z is greater than $\tilde{z}^*$ are competitive in the foreign country. Hence, home and foreign firms coexist in sectors between $\tilde{z}^*$ and $\tilde{z}$. Figure 3 illustrates the same outcome from a different perspective. It is also possible for one or both countries to produce all goods, in which case either $\tilde{z}$ equals one and/or $\tilde{z}^*$ equals zero. Which of these outcomes prevails in equilibrium depends on the wages in both countries and

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[5] In Neary (2002c) I show that the qualitative results continue to hold for more general specifications.

on the values of all the exogenous variables.

4. GENERAL OLIGOPOLISTIC EQUILIBRIUM

The model is one of general oligopolistic equilibrium, or "GOLE". Firms take wages and demand parameters as given when choosing their outputs, but exercise market power in their own sector. To close the model, we must relate the demand for goods to household behaviour, and the demand for labour to aggregate endowment constraints.

The underlying assumptions about consumer behaviour are set out in detail in Neary (2002c). They provide a rationalisation of demand functions which are perceived as linear by firms in individual sectors, but which depend on the marginal utility of income in a way that aggregates consistently across sectors. (In a similar way, the well-known approach of Dixit and Stiglitz (1977) rationalises demand functions which are perceived as constant-elasticity by individual firms, but which depend on the marginal utility of income in a way that aggregates consistently across sectors.) The essential result is that the demand function in (1) applies consistently to all sectors provided the parameters a' and b' equal constants deflated by the world marginal utility of income $\bar{\lambda}$ (which in turn equals the sum of the marginal utilities of income for the two countries): $a' \equiv a/\bar{\lambda}$ and $b' \equiv b/\bar{\lambda}$, where $\bar{\lambda} \equiv \lambda + \lambda^*$. The marginal utility of income is treated as a constant by individual firms: plausibly, since each sector is tiny in the economy as a whole, so any one firm has only a negligible effect on it. However, it is endogenous in general equilibrium. In particular, it depends negatively on the level of world income. Hence a rise in income shifts the demand curve for each good outwards.

The model as a whole has three key nominal variables: the home and foreign wage rates w and w^*, and the world marginal utility of income $\bar{\lambda}$. As always in trade models, the absolute levels of these variables are indeterminate. Rather than choosing an arbitrary numeraire, the natural way to solve the model is in terms of wages measured in utility units, that is, nominal wages multiplied by the world marginal utility of income. Thus we work from now on with the variables W and W^*, defined to equal $\bar{\lambda}w$ and $\bar{\lambda}w^*$ respectively.

Equilibrium in the world economy can now be illustrated easily, using Figure 5. Consider the market for labour in the home country. Equilibrium can be written as follows:

$$L \quad = \quad L^D(\underset{-}{W}, \underset{+}{W^*}, \underset{+}{n}, \underset{?}{\alpha_0}) \qquad \textbf{(6)}$$

(where the signs below the arguments indicate the responsiveness of labour demand to changes in its determinants, and will be justified below). Supply is assumed to be fixed at a given level L. Demand for labour L^D equals the sum of demands from all the active sectors in the home country, both those which face competition from foreign firms and those where only home firms are cost competitive. Consider the effects of an increase in the home wage W. This raises the cost of production for all active home firms and hence lowers their sales and their demand for labour. In addition, if home firms in some sectors are just on the threshold of profitability, they will no longer be able to compete. Hence the margin of home specialisation changes: the threshold home sector $\tilde{z}$ falls and for this reason too home demand for labour falls. Both these adjustments, taking place at the intensive and extensive margins respectively, reduce the total demand for labour at home. A similar argument can be used to show that home demand for labour is *increasing* in the foreign wage W^*. A rise in W^* squeezes foreign firms at both the intensive and extensive margins, and so encourages competing home firms to expand, raising their demand for labour.

The outcome of these arguments is that the L locus, representing home labour-market equilibrium, must be upward-sloping in $\{W,W^*\}$ space, as shown in Figure 5. Points above it correspond to excess supply of labour, which we would expect to put downward pressure on the home wage. Conversely, points below the L locus correspond to excess demand for labour, which we would expect to put upward pressure on the home wage. These tendencies are indicated by the vertical arrows in the diagram. An exactly symmetric chain of reasoning applies to the foreign country, and justifies an upward slope for the L^* locus, with horizontal arrows indicating the direction of wage adjustment in the foreign country. The equation for this locus is:

$$L^* \quad = \quad L^{*D}(\underset{+}{W}, \underset{-}{W^*}, \underset{-}{n}, \underset{+}{\alpha_0}) \qquad \textbf{(7)}$$

Hence equilibrium wages are determined by the intersection of the two loci at point A. Combining the two sets of arrows, it is clear that the L^* locus must be more steeply sloped as shown if the equilibrium is to be stable. The equilibrium wages in turn determine the equilibrium threshold sectors in the two countries, as illustrated in Figure 4.

5. COMPETITIVE AND COMPARATIVE ADVANTAGE

We are now ready to consider the different roles of absolute, comparative, and competitive advantage, as discussed in the introduction. Figure 4 illustrates equilibrium from the perspective of individual sectors, while Figure 5 illustrates it from the perspective of the world economy as a whole. Combining both figures therefore allows us to illustrate the effects of changes in technology and the degree of competition. This is done in the two-panel diagrams in Figures 6 and 7.[6] As drawn, the world economy is initially in a symmetric equilibrium, with equal numbers of firms in all home and foreign sectors, equal labour

[6] The only change from the earlier figures is that the axes in the left-hand panel are multiplied by $\bar{\lambda}$. This has the convenient implication that the apex of the panel, the point $\{a,a\}$, is unaffected by changes in exogenous variables.

endowments, and symmetric productivity distributions.

Consider first the effects of an increase in the competitiveness of the home economy. Assume that a tougher anti-trust stance or some other change in the regulatory environment leads to an increase in the number of firms in all home sectors. Figure 6 illustrates the implications. At the initial wages, the locus separating the *HF* and *H* regions in the left-hand panel shifts to the left (indicated by the arrow numbered 1), as some foreign sectors are no longer competitive. As we have already seen in Section 2, from equations (2) and (3), output per firm falls in all home sectors, but not by enough to offset the rise in the number of firms. Hence home demand for labour increases, shifting upwards the *L* locus in the right-hand panel of Figure 6 (indicated by the arrow numbered 2). Similar but opposite effects in the foreign country reduce labour demand there, shifting leftwards the L^* locus (indicated by the arrow numbered 3). Not surprisingly, it can be shown that the relative wage in the home country, W/W^*, definitely rises; and, provided own-effects on labour demand dominate cross-effects (which must be true if the initial equilibrium is symmetric), the absolute wage rises at home and falls abroad.

The net effect of these wage changes is to shift the cost distribution locus in the left-hand panel of Figure 6 upwards (arrow number 4), raising its slope as shown. The implications for resource allocation are dramatic. The induced wage changes do not fully reverse the impact effects of the increase in the number of home firms: it is still true that home output rises in many sectors. But this does not happen in all: some marginal home sectors can no longer compete because of the economy-wide rise in wages. Thus increased competitive advantage is a two-edged sword: it raises home output in sectors where home firms enjoy a significant comparative advantage, but it leads the home country to specialise *more* in accordance with comparative advantage, exiting some sectors as home wages rise.

6. ABSOLUTE AND COMPARATIVE ADVANTAGE

All countries exhibit comparative advantage in the same way, but they can exhibit absolute advantage in many different ways. Here I consider the simplest form of a gain in absolute advantage by the home country: a uniform reduction in the costs of each sector; i.e., a fall in α_0 in (5). As we will see, even this simple way of modelling differences in absolute advantage between countries raises a rich range of possibilities.

The effects of such a gain in absolute advantage are illustrated in Figure 7. Since we assume that the numbers of firms in all active sectors in the two countries do not change, the loci separating the *F*, *HF* and *H* regions in the left-hand panel do not move. Instead, the impact effect of the shock is that, at the initial wages, the downward-sloping locus representing the cost distribution in the left-hand panel of Figure 7 shifts downwards (indicated by the arrow numbered 1). Not surprisingly, foreign firms can no longer compete in some sectors, as costs fall for all home firms. As in Section 5, however, these clear-cut initial effects are dampened and in some respects possibly offset by the induced changes in wages. Consider first the effect on the home country's demand for labour. In each sector z, labour demand equals $\alpha(z)y(z)$. The fall in α_0 reduces demand for labour per unit output, but increases the level of output. Hence the change in the demand for labour is ambiguous in each sector, and also at the level of the economy as a whole, and so the L locus in the right-hand panel of Figure 7 may shift upwards or downwards (as indicated by the arrow numbered 2). By contrast, foreign firms do not enjoy any productivity gains, they face more cost-efficient home firms in all sectors, and they are squeezed out of some sectors altogether. Hence the foreign demand for labour definitely falls, shifting the L^* locus to the left (indicated by the arrow numbered 3). Unlike Section 5, there is no presumption that home wages rise either absolutely or relatively, though foreign wages almost certainly fall.

These wage changes shift the cost distribution locus in the left-hand panel of Figure 7. In the case shown (indicated by arrow number 4), the locus shifts leftwards (because W^* falls) and its slope increases (assuming W does not change much, so W/W^* rises). This tends to dampen and may even offset the initial changes in specialisation patterns. Because production costs have fallen in both countries, the range of sectors in which *both* home and foreign firms are competitive actually rises. Paradoxically, a fall in home production costs in all sectors may lead to entry by foreign firms into some marginal sectors where they were previously uncompetitive. A unilateral gain in absolute advantage thus leads both countries to specialise less in accordance with comparative advantage.

7. CONCLUSION

In this paper, I have used simple geometric tools to explore the interactions between comparative, competitive and absolute advantage in a two-country model of oligopoly in general equilibrium. The model allows for oligopolistic interaction between firms, so it can address the issue of changes in the degree of competition in an economy, and it allows a country to exit some sectors while at the same time entering others. The model is also a general equilibrium one, so it can be used to examine economy-wide production and trade patterns, and to track the links between goods and factor markets. In all cases, we found that comparative advantage continues to determine the direction of trade. However, both competitive and absolute advantage impact on resource allocation, trade patterns and trade volumes. An improvement in home competitive advantage, in the sense of an increase in the number of home firms in all sectors, drives foreign firms out of marginal sectors but also makes some marginal home sectors uncompetitive. An improvement in home absolute advantage, in the sense of a rise in labour productivity in all sectors, tends to raise home output but also leads both countries to specialise less in accordance with comparative advantage. These results show that factor productivity and firm competition interact in complex ways, and so this paper can be seen as a partial attempt to formalise the determination of national competitive advantage stressed by Porter (1990).

Showing that absolute advantage has an important role may be viewed as either obvious or dangerous - or both! It may seem obvious because, even in the simplest two-good Ricardian model, an increase in one country's absolute advantage always raises its relative wage, and may induce a change in the pattern of specialisation. With many sectors, it must always affect specialisation patterns, even under competitive conditions. This point was made clearly by Samuelson (1964) in the paper which introduced the competitive continuum model: "The whole content of the theory of comparative advantage is this: We can never be exporting a good *i* while exporting a good *j* if our comparative advantage is in good *j* rather than in good *i*." He then proceeded to show that, even under competitive conditions, there is plenty of scope for absolute cost differences to influence production and trade. However, allowing for oligopolistic competition enriches the range of possibilities in non-obvious ways. As we have seen, changes in absolute cost levels may lead a country to exit some sectors while simultaneously entering others. Moreover, a model with imperfect competition is needed to explore how changes in the degree of competition affect the structure of the economy.

Alternatively, drawing attention to the roles of competitive and absolute advantage may seem like indulging what Krugman (1994), in his critique of the Clinton administration's concern with improving U.S. competitiveness, called a "dangerous obsession". Of course, Krugman's concern was to rebut neo-mercantilist arguments justifying policies such as restricting imports or selectively helping large exporting firms. The desire to counter such arguments should not distract from the findings above that a gain in absolute advantage will not just affect aggregate productivity and income, but will also affect the pattern of international specialisation.

While not necessarily justifying any form of policy intervention, these results can be used to explain the use of measures to give a cost advantage to the home economy. An example of such a policy measure is what Corden (1981) has called "exchange rate protection": deliberately maintaining an undervalued exchange rate in order to confer a competitive advantage on home firms. The difference is that here it operates not at the margin between traded and non-traded goods (as in Corden’s analysis), but rather at the twin margins where home and foreign firms find it profitable to enter different oligopolistic sectors. It should be repeated, however, that nothing in the present paper can be used to justify this kind of intervention, since I have not presented a full welfare analysis. This is only one of many directions in which the analysis in the paper needs to be extended.

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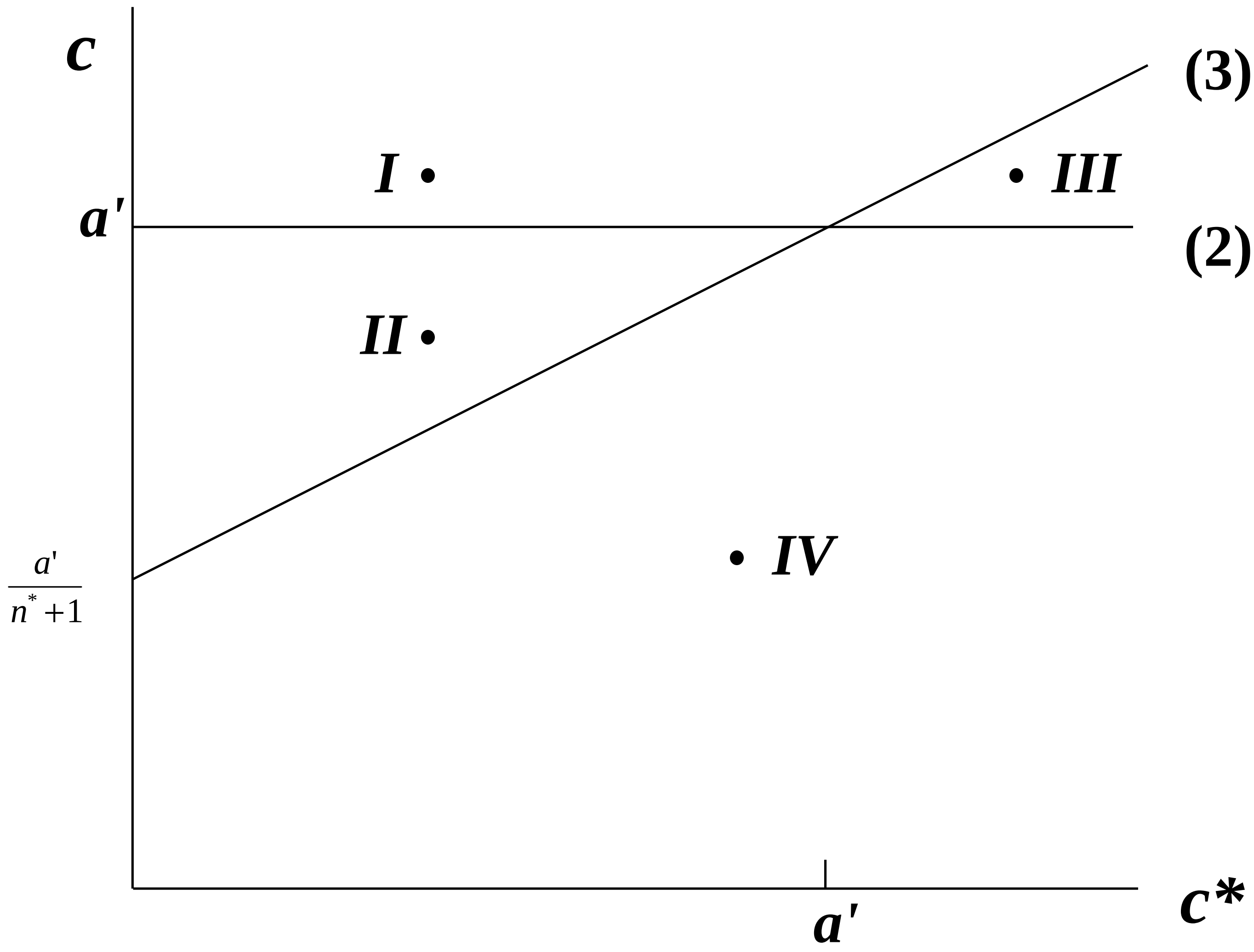

Figure 1: Regions of Profitable and Unprofitable Home Production

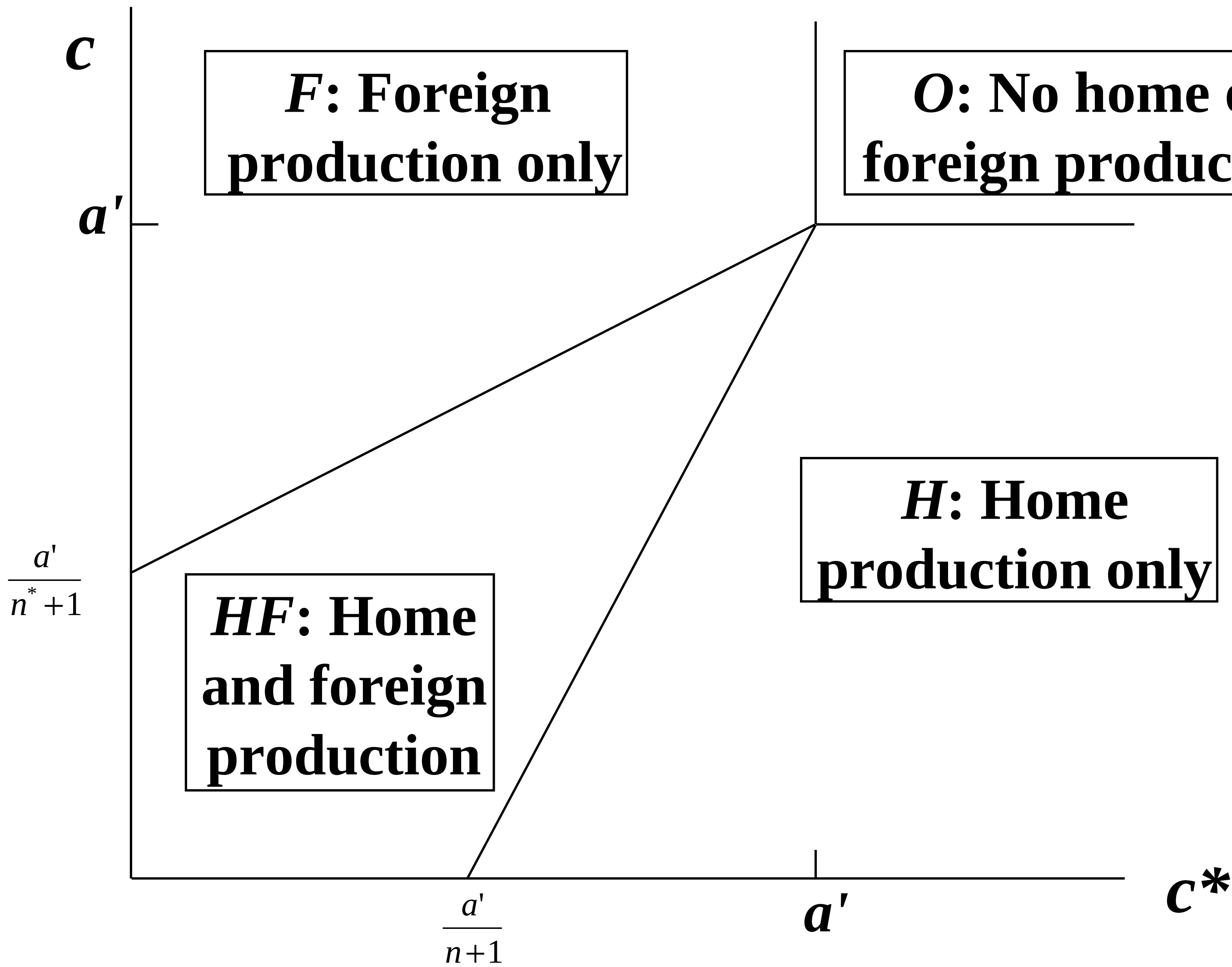

Figure 2: Equilibrium Production Patterns for Arbitrary Home and Foreign Costs

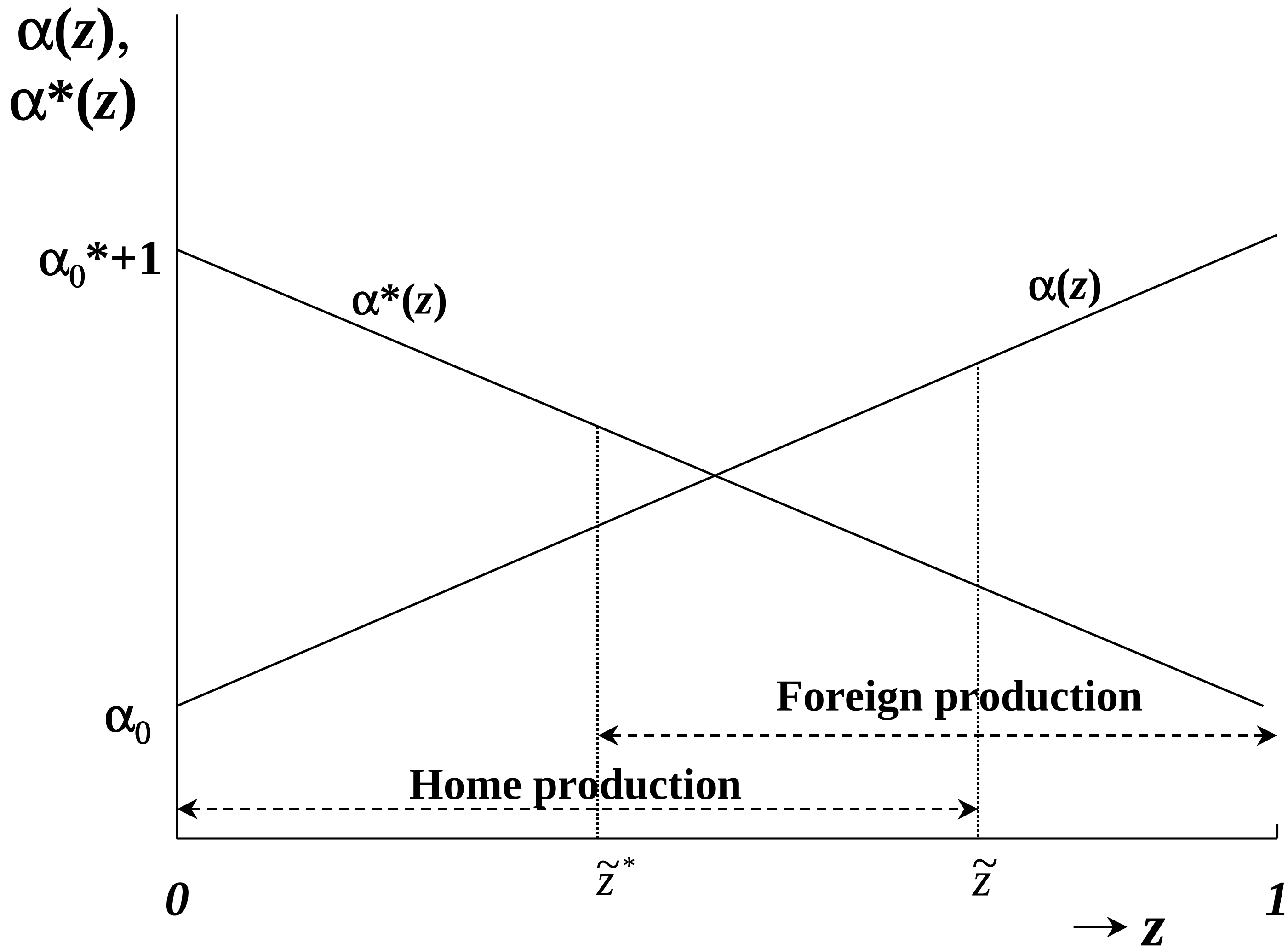

Figure 3: Home and Foreign Technology Distributions

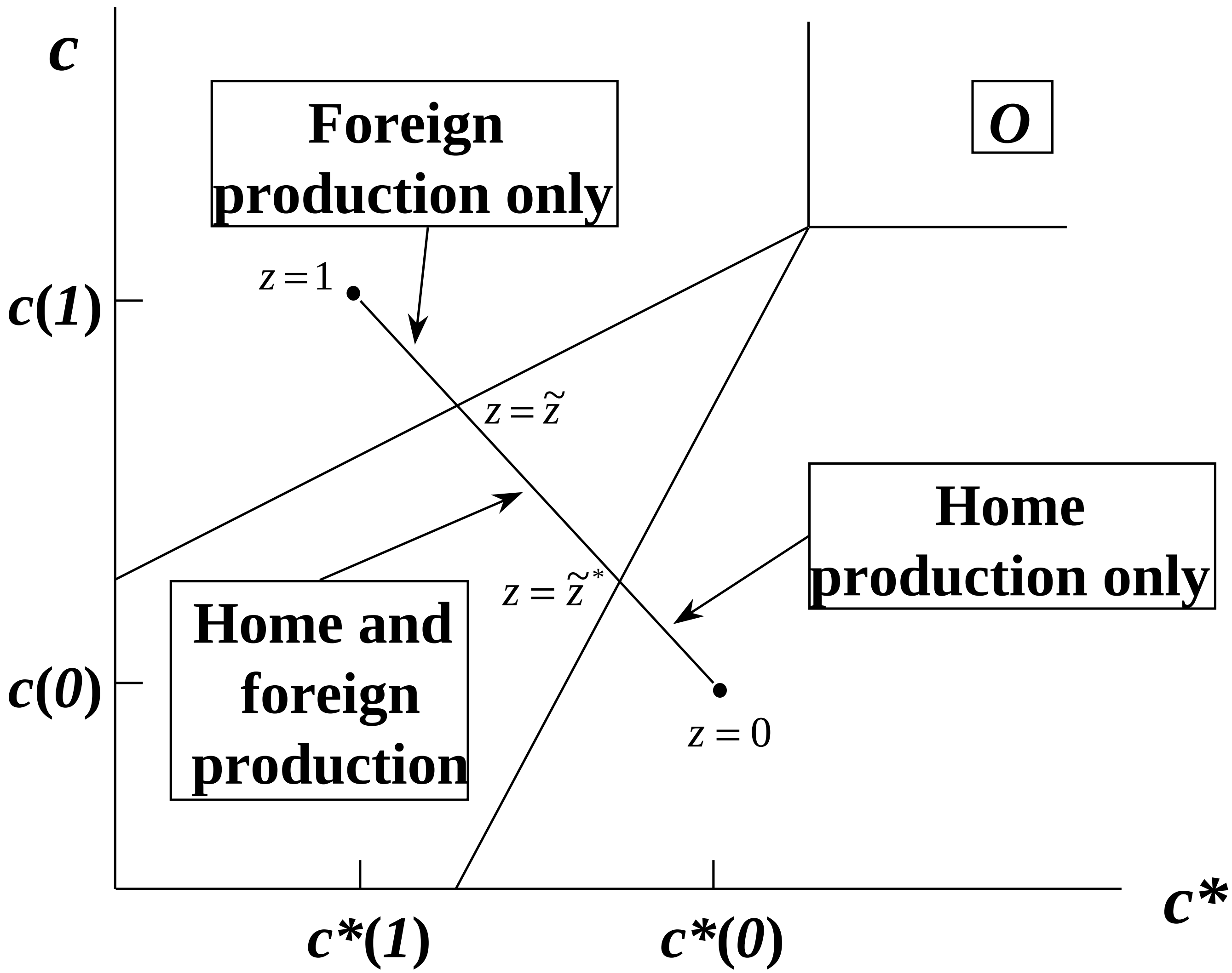

Figure 4: Equilibrium Production Patterns for a Given Cost Distribution

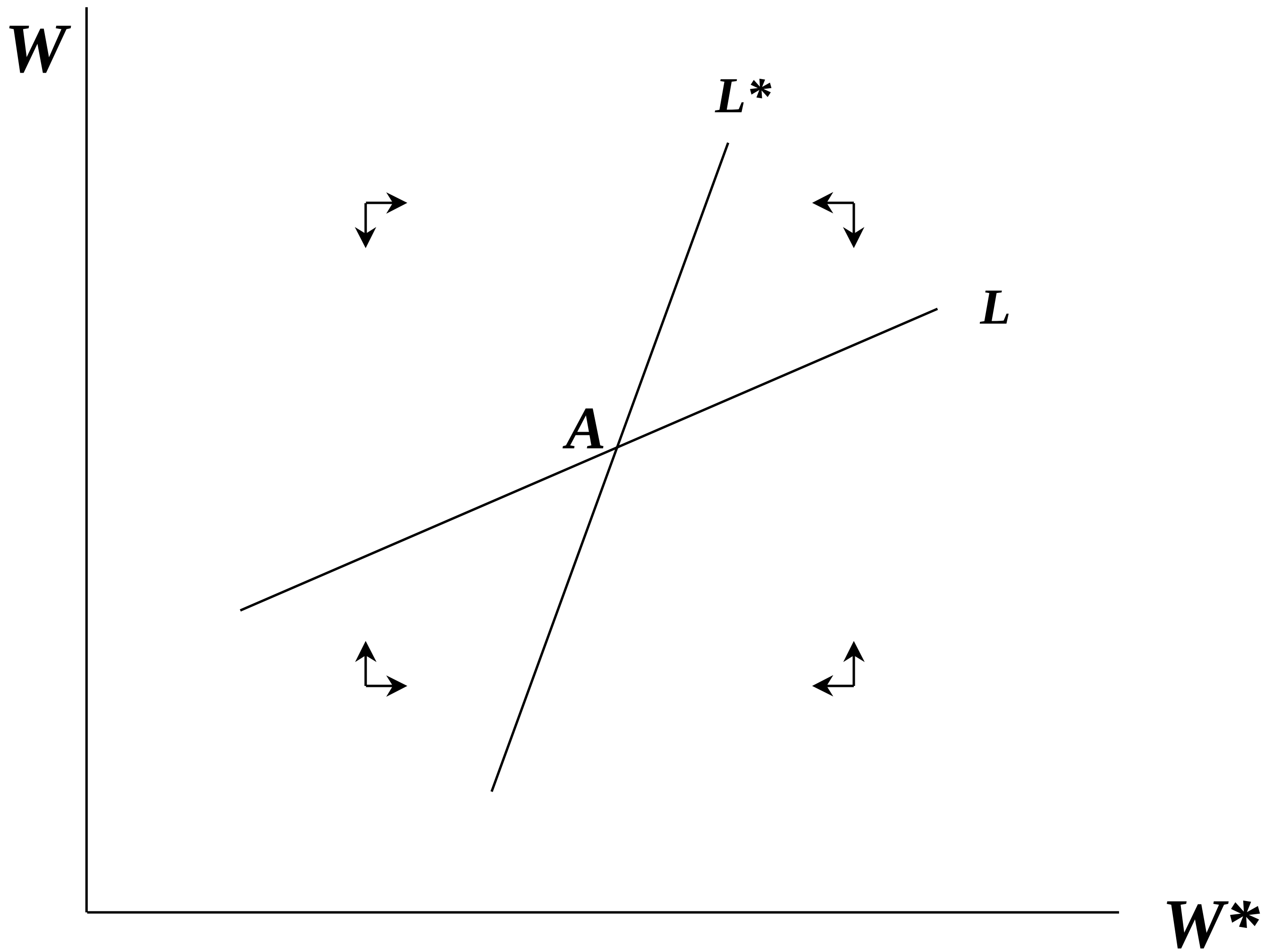

Figure 5: General Equilibrium in the World Economy

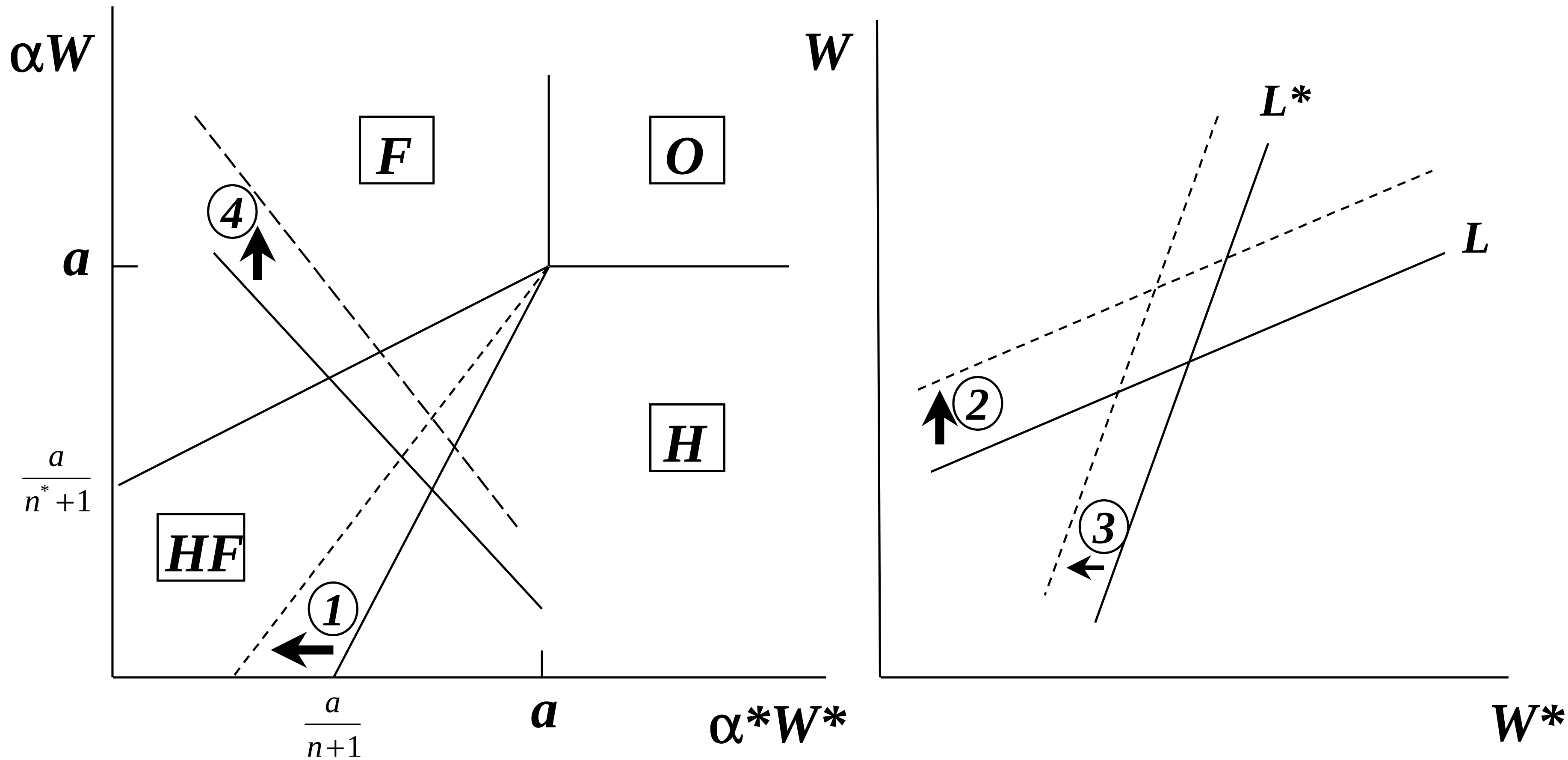

Figure 6: Comparative versus Competitive Advantage: Effects of an Increase in *n*

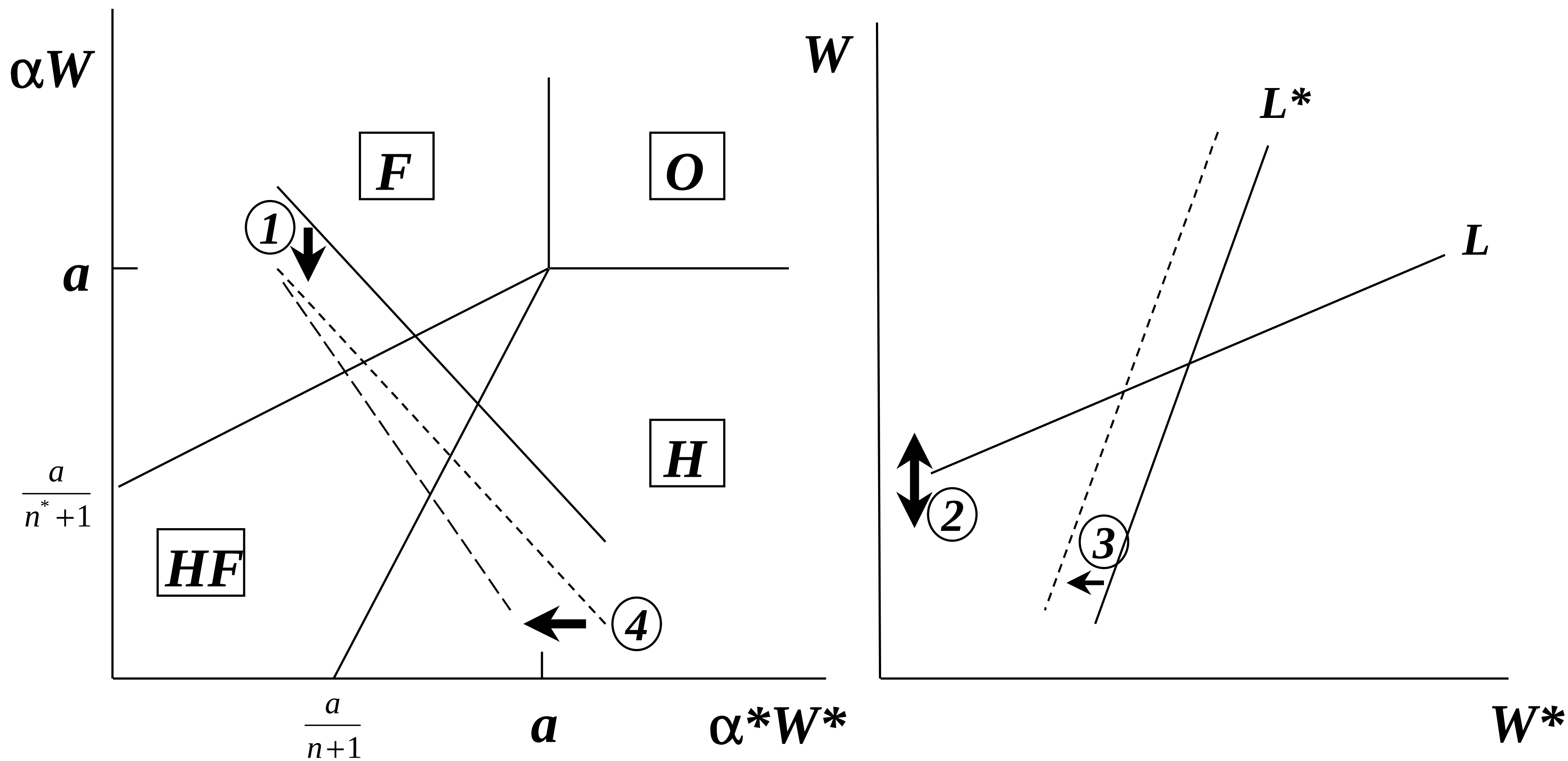

Figure 7: Comparative versus Absolute Advantage: Effects of a Fall in α_0