



## Comparative Advantage

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### Summary

Nobel laureate in economics Paul Samuelson was once challenged to name one proposition in all the social sciences that was both true and non trivial – his response: **comparative advantage**. The theory of comparative advantage states, quite simply, that there are gains to all parties from allowing economies to specialize and to trade with one another. This is true even if an economy is not the best producer of anything – even without an absolute advantage, a country can have a *relative* advantage in the production of a certain commodity and thus benefit from trade.

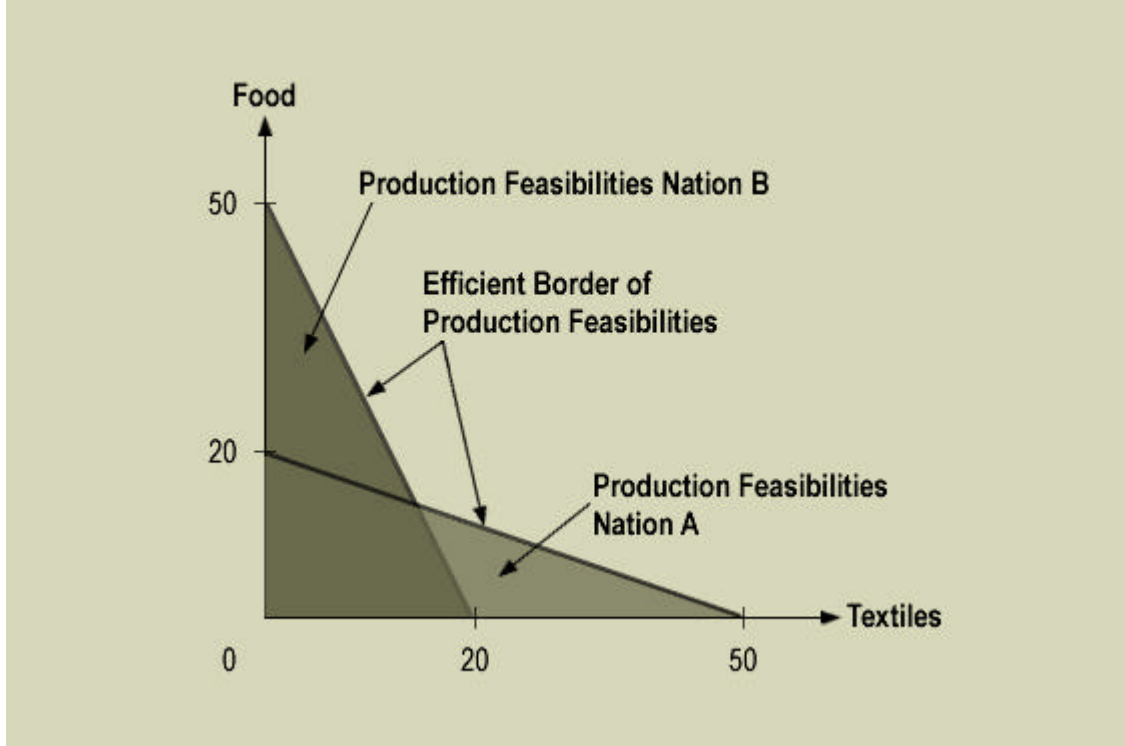
The conventional illustration of the theory typically involves a two-goods, two-nations example. However, adding a third nation to the picture complicates matters tremendously. Although the principle of comparative advantage still holds true – there is an overall gain from trade – the distribution of the gain is altered. This leads to an outcome that can be modeled using game theory and shows why many countries may resist free trade despite the theoretical benefits.

### Autarky: optimization without trade

Let us consider a simplified case that illustrates the theory of comparative advantage. Take two different nations with identical consumer preferences and identical labor resources. The consumers in both nations only demand the goods: *food* and *textiles*, and the value of these two goods is equivalent. The two nations differ in their productivity of the two goods: Nation A is more efficient at producing food and Nation B at producing textiles. Putting some numbers to the case, let us assume that the total labor resources in each nation are equal to 100 (e.g., labor-hours). In Nation A, it takes 2 units of labor to produce 1 unit of food (e.g., a sack of flour) and 5 units of labor to produce 1 unit of textile. By contrast, workers in Nation B require 5 units of labor to produce 1 unit of food and only 2 units of labor to produce 1 unit of textile.

There is thus a trade-off in the amount of each good that either nation can produce and consume without trade, represented by the graph below:

## PRODUCTION FEASIBILITIES AND EFFICIENT BORDER IN TWO COUNTRIES



For example, Nation A could produce a maximum of 50 units of food (and no textile) or 20 units of textile (and no food) or some combination of the two. The situation for Nation B is the inverse. Since both nations need to consume both food and textiles and they cannot trade with one another, they will need to produce some of both. The policy name for this situation is “autarky” – which emphasizes national economic self-sufficiency. It turns out that under autarky welfare is maximized for Nation A if it produces 25 units of food and 10 units of textile, and for Nation B if it produces 10 units of food and 25 units of textile.

Nation A:  $25 \text{ food} \times 2 \text{ labor unit/food} + 10 \text{ textile} \times 5 \text{ labor unit/textile} = 100 \text{ labor units}$

Nation B:  $10 \text{ food} \times 5 \text{ labor unit/food} + 25 \text{ textile} \times 2 \text{ labor unit/textile} = 100 \text{ labor units}$

Both nations thus employ all the labor available, as shown in the equations above, and both derive welfare, or “utility” equal to the product of the goods consumed:

Nation A:  $\text{Utility} = 25 \text{ food} \times 10 \text{ textile} = 250$

Nation B:  $\text{Utility} = 10 \text{ food} \times 25 \text{ textile} = 250$

(Note: Click [here](#) for a more rigorous derivation of the optimum utility under autarky.)

### International Trade: benefits from specialization

With international trade, each nation is able to specialize on the production of the good for which it has a comparative advantage and import the good for which the producers in the other nation have the advantage. In our example, the producers in Nation A will specialize fully on the production of food, while producers in Nation B will convert all their resources to the production of textiles.

Because of this specialization, we can see at once that the overall pool of goods available increases as each nation is able to produce 50 units of the specialized good, using the same assumptions as previously.

Nation A: **50 food** x 2 labor unit/food = 100 labor units

Nation B: **50 textile** x 2 labor unit/textile = 100 labor units

Since food and textiles are of equivalent value, one unit of food can be traded in exchange for one unit of textile. The optimum level of trade is therefore reached when Nation A trades 25 units of food in exchange for 25 units of textile from Nation B. Therefore, the relative price of food and textile is one. With trade, total consumption of goods is increased for both nations and utility increases:

Nation A: Utility = 25 food x 25 textile = 625

Nation B: Utility = 25 food x 25 textile = 625

(Note: Click [here](#) for a more rigorous derivation of the optimum utility with trade.)

The analysis shows that specialization increases the size of the pie as nations specialize in areas where they have a comparative advantage, and trade leads to an efficient distribution of goods that benefits all nations. This is true even if, for example, Nation A were more efficient than Nation B at making both food *and* textile (i.e., Nation A has an *absolute* advantage in both goods). Even in this case, it would still make sense for Nation A to specialize in the product that it can produce most efficiently and import the other product from Nation B. Thus, it is impossible for a country not to have a comparative advantage in some good and there will always be gains from trade.

### **Consequences of the entrance of a third nation**

Most basic economics texts take the analysis this far. However, the situation grows much more complex if we extend it to include a third nation. For simplicity, let us consider a Nation C that is an exact copy of Nation A – it specializes in food production and imports textiles.

Because the demand for textiles is now twice as much as before, the world price for textiles will double, so that each unit of textile will now cost 2 units of food. The entrance of Nation C is thus positive for Nation B, which can export textiles at a higher price, but is a threat to Nation A. Given our former assumptions, the optimum level of trade will result in the following distribution of welfare:

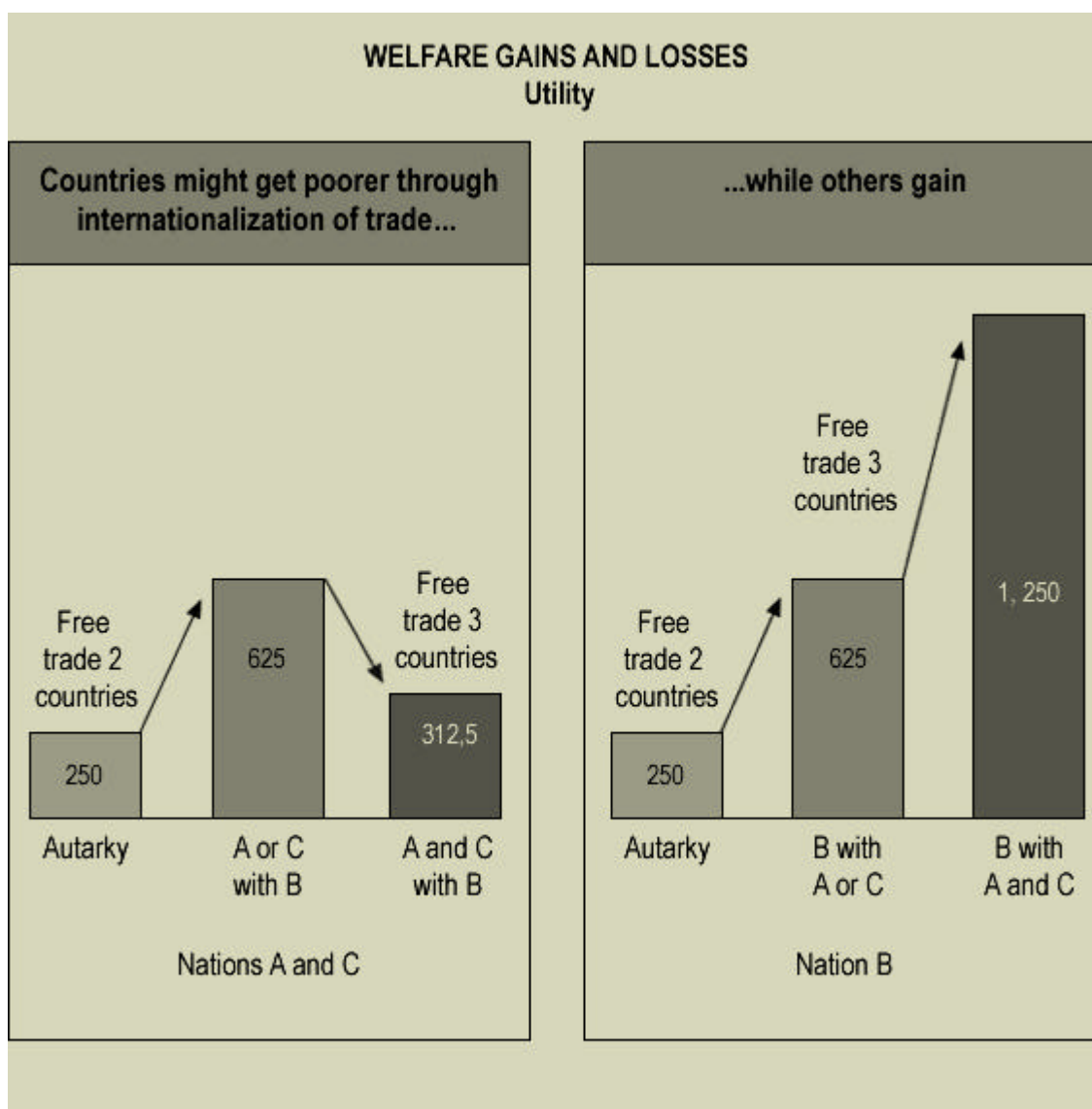
Nation A: Utility = 25 food x 12.5 textile = 312.5

Nation B: Utility = 50 food x 25 textile = 1,250

Nation C: Utility = 25 food x 12.5 textile = 312.5

We can see that the principle of comparative advantage still holds true and that overall utility is increased by the entrance of Nation C (i.e., global utility increases from 1,500 to 1,875) but not everyone benefits equally. Nation A is still better off than it was under autarky but not as well off as before Nation C's entrance. It still has an incentive therefore, to participate in international trade, but also has an incentive to try to block Nation C from entering. Alternatively, Nation A could try to extract some of the benefit that accrues to Nation B from the entrance of Nation C. For example, even if B paid A the full amount by which it is worse off after C enters (i.e., 312.5), B would still be better off than it was without entrance by C.

(Note: Click [here](#) for a more rigorous derivation of the consequences of new entry.)



### Implications for the welfare of nations

Specializing like Nation A on a technology or product, which can be easily copied by a new competing nation, makes one vulnerable to new entry, whereas exploiting a competitive advantage in one area, like Nation B, leads to higher welfare. Of course, Nation B cannot be assured that its advantage will be sustainable over time. Therefore, seeking continuously competitive advantage (new products, better production conditions) is as necessary for nations as it is for companies.

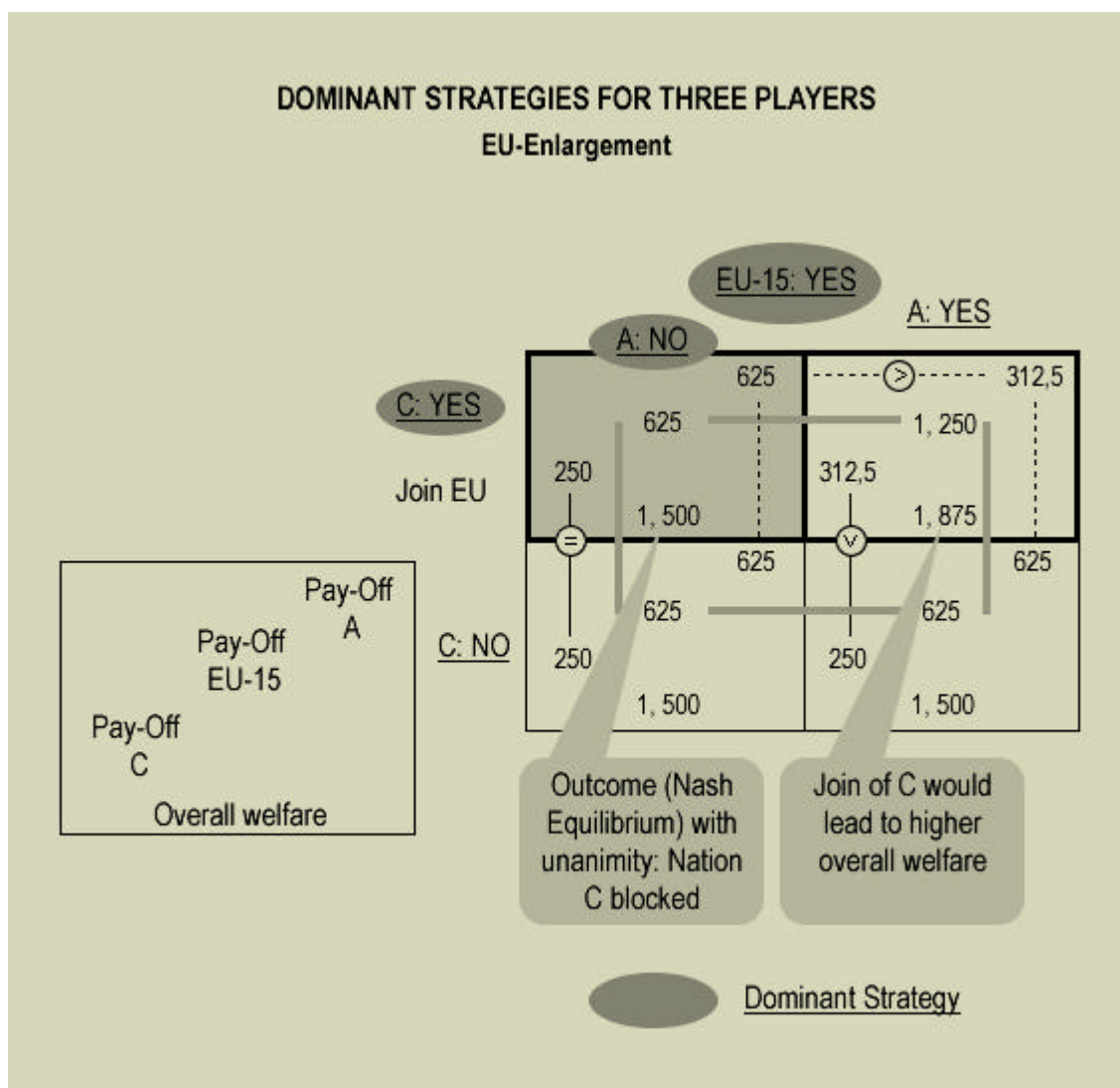
The other implications relate to the incentives for established trading partners to block entrance by new countries (particularly those that can offer substitutes for goods currently produced by existing partners). In these cases, the compelling logic of comparative advantage and the overall gains from trade can fall victim to the interests of individual nations. If they can block entry of new trading nations or extract rewards for their compliance, it will be in their interest to do so. These issues arise regularly in real-world situations regarding negotiation of free trade agreement (for example, the expansion of the European Union to include new countries in Eastern Europe) and are better understood using the competitive framework of game theory to understand the costs and benefits to the different parties.

Ten Eastern European countries are knocking at the EU's door. The negotiations between the EU and these countries are not concluded yet, but it seems as if these countries will join in concert in 2004 or 2005. Is this the optimal path or would it be better to let them join sequentially? Let us apply the above findings with the assumption that these ten countries are similar to each other in terms of their production feasibilities. One alternative to a one-time enlargement would be a sequential process with

five countries joining in 2004 and the remaining five joining in the future. How might this staged approach affect the voting process for the second round of enlargement?

Let us assume that the former EU-15 would benefit from the first enlargement by an increase of its welfare from 250 to 625. The first five Eastern Europe countries would also benefit by an equal rise of their welfare from 250 to 625 (figures are for illustrative purposes only). Assume that the original EU-15 would also benefit from a second round of enlargement, which would further increase their welfare to 1,250. They will therefore vote for both rounds of expansion. This second expansion, however, would reduce the welfare of the first five joiners from 625 to 312.5 as they face more competition from new entrants.

The following matrix shows the pay-offs for the three players (the EU-15, the first five joiners (A) and the remaining five (C)) from a second round of enlargement. In order for enlargement to succeed, the vote must be unanimous, which means that all countries must vote "YES" for the acceptance of the enlargement. If at least one country votes "NO", the status quo (EU-15 plus first five) would be retained.



As stated above, the original EU-15 stand to benefit from both rounds of expansion and will thus vote "YES". For C (the five new applicants), there is no better strategy (dominant strategy) than to vote to join to the EU, since doing so would raise welfare from 250 to 312.5 if the other two parties also voted "YES". If one of the others voted "NO", they would remain at their initial value of 250 without losing anything. This does not hold, however, for A (the first five). They would lose from a further enlargement and would therefore vote, completely rationally, "NO". Since all involved parties have a dominant strategy, the Nash equilibrium is a non-ambiguous NO-YES-YES vote, meaning that the second round of enlargement would be blocked. This would

not only be a pity for the EU-15 and the C (the remaining five) as they cannot realize their cooperation benefits, but also overall welfare would remain at 1,500 – lower than the 1,875 that would be feasible with expansion. This analysis suggests that the decision to integrate all ten Eastern European countries at once may be preferred, leading to higher overall welfare and avoiding incentives for some countries to block further expansion.

What do these findings tell us?

- Internationalization of trade may impoverish nations. Even though comparative advantage means that welfare is maximized through trade, it may still be rational for certain nations to oppose free trade.
- Still, free trade is efficient. Overall welfare gain provides ample opportunity to compensate suffering countries. (E.g., EU-enforced German payments supporting French agriculture might be more than offset by a (Western) Europe-wide market for German manufactured goods.)
- Voting rights matter. Since a sequential enlargement might be blocked by existing members, voting rights can have a substantial impact on the outcome. In the above case, the outcome would be completely different under majority rule. The unanimity rule seems plausible for decisions with a substantial impact on the welfare position of the involved countries in order to empower them to enforce compensation.
- Understanding helps. Welfare can be maximized if the involved parties are able to see beyond their immediate circumstances. A larger, strategic understanding would allow them to negotiate conditions that would lead to better outcomes for all parties.

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- The benefits of theory - a sound understanding of larger systems described by theory can help us understand our own self-interest and guide rational decision-making
- Dealing with the real world - theoretical soundness is often not enough to make policies effective and implementation requires us to understand and deal with particular obstacles

Keywords:

Trade, advantage, relative, absolute, benefit, game theory, production, economics, autarky, entry, competition, utility, welfare, specialization, international, trading blocs, European Union

Related links:

[See the math](#)