Comparative and Absolute Advantage and the Production Possibilities Frontier[1]
Instructional Primer[2]

The Ricardian principles of **Comparative** and **Absolute Advantage** have shaped the discussion on trade for centuries, indeed they form the basis from which we understand why two nations engage in trade. Though this primer will focus on trade between two nations, these principles are equally as informative in respect to why any two macro economies might enter into trade.

Absolute Advantage (AA)

A nation is said to have an **Absolute Advantage** (AA) over another nation when its cost of production of the good is less than the other nation's cost of production of the good.

Comparative Advantage (CA)

A nation is said to have a **Comparative Advantage** over another nation in the manufacture of a good when its opportunity cost in the manufacture of that good is less than the opportunity cost of the other nation's manufacture of the same good.

Production Possibilities Frontier (PPF)

A nation's **Production Possibilities Frontier** is the curve or plane on which the nation is capable of producing as it uses its productive capacity efficiently. It can be thought of as the nation's binding constraint in terms of economic growth in that a nation can affect its growth prospects as it uses its productive resources efficiently.

Two nations: Mira and Drovanna

Unlike **Absolute Advantage** and **Comparative Advantage**, a nation's PPF can be measured irrespective of any comparison against other nations. To do this we're going to consider two hypothetical nations, Mira and Drovanna, with productive capacity arising from their endowments of labor and natural resources in the manufacture of two goods: capital (K) and consumables (C) as follows:

	Capital (K) per worker	Consumables (C) per worker	Labor Force
Mira	10	55	2,500,000
Drovanna	75	60	1,000,000

We immediately see that Mira has a much larger labor force, but on a per worker basis produces fewer units of K and C each period than does Drovanna. Based on the presumption that the value of one worker in Mira is equal to the value of one worker in Drovanna, we can see that the cost of producing K or C in Mira is greater than the cost of producing K or C in Drovanna in that on a per worker basis workers in Mira are capable of producing fewer units of either good. This would inform us that Drovanna has an **Absolute Advantage** over Mira in the production of K and C.

To reveal the **Production Possibilities Frontiers** we need to consider the production capacity of each nation by multiplying the per worker output by the number of workers and arrive at the following values:

	Capital (K)	Consumables (C)
Mira	25,000,000	137,500,000
Drovanna	75,000,000	60,000,000

We read the table as Mira can put all of its productive capacity into the manufacture of K and produce 25,000,000 units, or into C and product 137,500,000 units. Drovanna can do likewise and produce either 75,000,000 units of K or 60,000,000 units of C. We plot these with K on the Y axis and C on the X axis using the values for K and C calculated above for each nation. We can then see the shape of their **Production Possibility Frontiers** as illustrated by the follow graphs:

Nations, like any economic agents, will engage in trade if they believe there are gains to be found from so doing. Ricardo's principles suggest that these gains are the result of each nation specializing in the production of that good in which it has a **Comparative Advantage.** The **Comparative Advantage** is said to belong to that nation with the lowest opportunity cost in the manufacture of a particular as

compared to the opportunity cost the other nation has in the manufacture of the same good. The opportunity cost is measured by identifying the units of one good a nation must give up, in terms of production, in order to manufacture the other good. For example, in order to produce 10 units of K Mira gives up the production of 55 units of C. To break this down to the opportunity cost of producing one unit of K we divide K per worker by C per worker – this gives us one unit of K in terms of units of C as noted in the following table:

	Capital (K) per worker	Consumables (C) per worker	1 unit of K =	1 unit of C =
Mira	10	55	$\frac{C}{K} = \frac{55}{10} = 5.5\ C$	$\frac{K}{C} = \frac{10}{55} = 0.19\ K$
Drovanna	75	60	$\frac{C}{K} = \frac{60}{75} = .8\ C$	$\frac{K}{C} = \frac{75}{60} = 1.25\ K$

Note that we always express the value of one unit in terms of the other unit and that we do this by placing in the denominator the value of the units we're seeking to measure.   In this case, when we want to see the cost of 1 unit of capital (K) we're determining this in respect to units of consumables (C) so we place the value of K in the denominator, the value of C in the numerator, and express the quotient in terms of C. This reveals the opportunity cost of creating one unit of K in terms of C, or the case of Mira the opportunity cost of one unit of K = 5.5 units of C; Mira gives up the manufacture of 5.5 C for every K it produces.
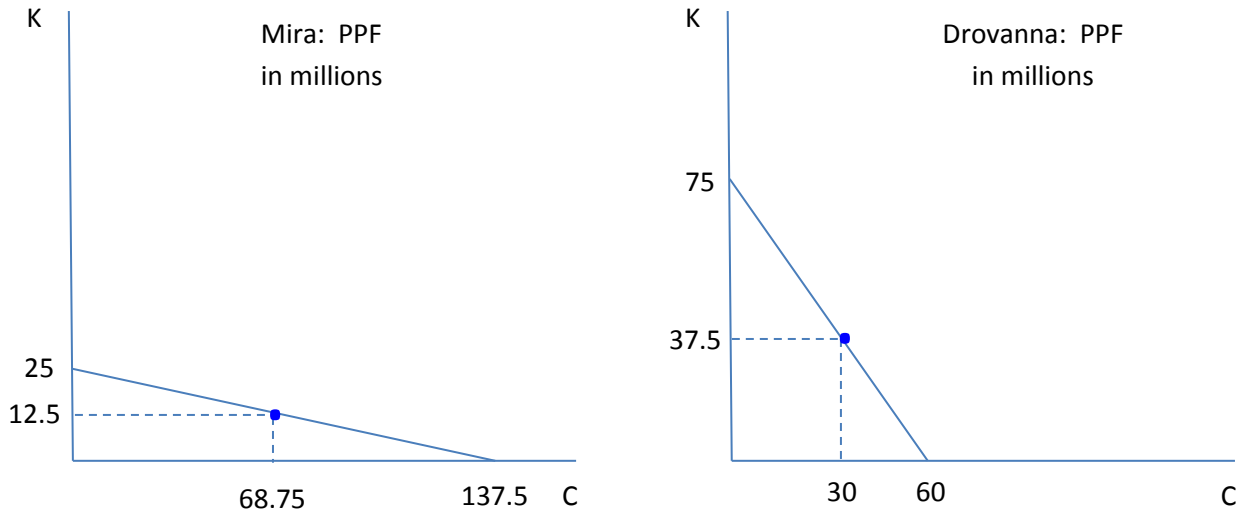
In this case, Mira's opportunity cost of producing K = 5.5 C and is higher than Drovanna's cost of .8 C such that Drovanna has the **Comparative Advantage** in the production of K, and Mira's opportunity cost of producing C = .19 K and is lower than Drovanna's cost of 1.25 K such that Mira has the **Comparative Advantage** in the production of C

Gains From Trade

To understand the potential gains from trade we need to understand a nation's productive capacity in autarky, or without trade. To do this we're going to assume that each of our two nations uses 50% (1/2) of their respective productive capacities in the manufacture of each good as follows:

	Capital (K) per worker	Consumables (C) per worker	Labor Force	K per worker x (Labor Force x .5)	C per worker x (Labor Force x .5)
Mira	10	55	2,500,000	12,500,000	68,750,000
Drovanna	75	60	1,000,000	37,500,000	30,000,000
Total				50,000,000	98,750,000

To visualize this level of domestic production and consumption we can insert these autarky values on the respective nation's PPF's as follows:
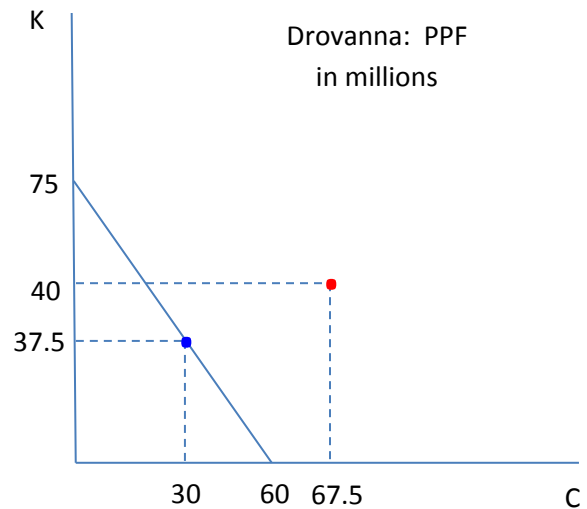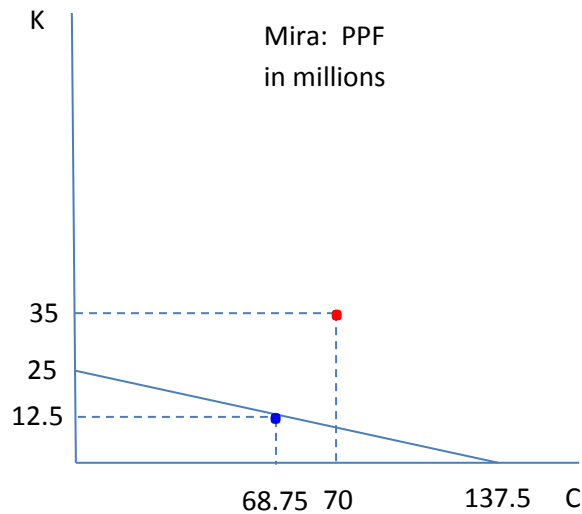

Now we can also assume that if the two nations enter into trade , they each commit 100% of their respective production capacities in the manufacture of the good for which each has the Comparative Advantage as follows (recall that Drovanna has the CA in K and Mira has the CA in C):

	Capital (K) per worker	Consumables (C) per worker	Labor Force	K per worker x Labor Force	C per worker x Labor Force
Mira	0	55	2,500,000	0	137,500,000
Drovanna	75	0	1,000,000	75,000,000	0
Total				75,000,000	137,500,000

From this we can see that the two nations can gain from trade. In autarky the combined production of K is 50,000,000 < 75,000,000 produced as a result of trade, and the combined autarky production of C is 98,750,000 < 137,500,000 produced as a result of trade.
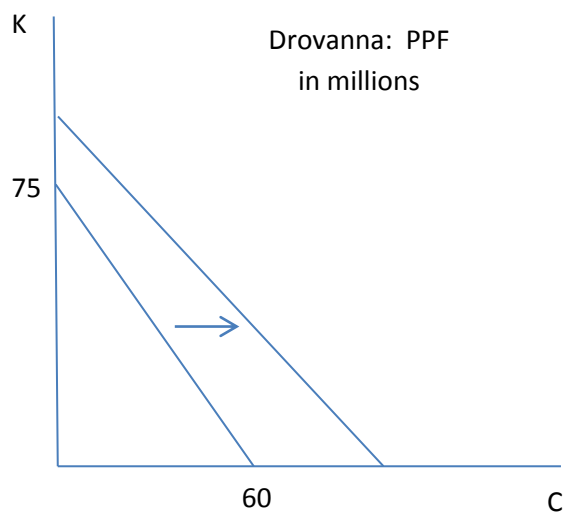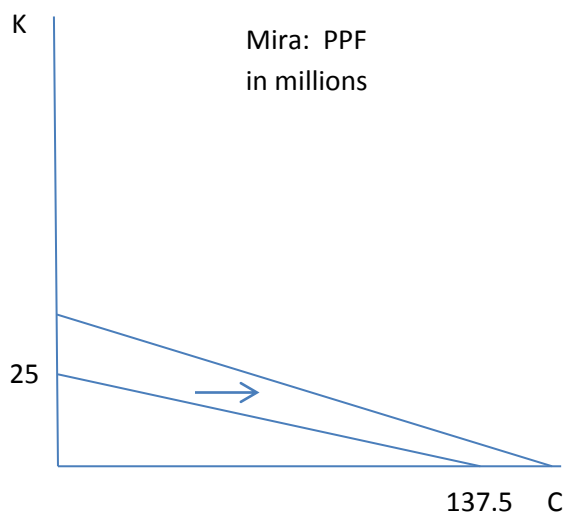
We can visualize the benefit of this by observing these values on the nation's PPF's, but we need to make some assumptions first, we need to know how much of each good the nations each want to keep for domestic needs and how much each wants to export. We'll start by assuming that these nations each want to keep an amount greater than that which they produced under the autarky assumption and then export the rest, so we'll assume that Mira keeps 70,000,000 C and exports 67,500,000 C (135,500,000 – 70,000,000 = 67,500,000) and that Drovanna keeps 40,000,000 K and exports 35,000,000 K (75,000,000 – 40,000,000 = 35,000,000). With these assumptions we can visualize the PPF's of these nations and see that with trade each is able to enjoy a higher standard of living as follows:

K Mira: PPF
in millions

35

25
12.5

68.75 70   137.5   C

K Drovanna: PPF
in millions

75

40
37.5

30   60 67.5   C

Why nations trade

So we can see that these nations are each able to enjoy the benefits of greater levels of C and K. In this case each nation now has more C and K to be used for the current and future benefit of their population and as such, we can reasonably expect that these populations are able to enjoy a higher standard of living (development).

Since there are no other nations in the example, we need to assume that each nation consumes the new (higher) level of consumables and keeps for future production needs the higher levels of capital. This allows these nations to further benefit from trade as their respective future PPF's, each a function of the amount of capital each nation holds, pushes out and to the right. In this case, I've also changed the slope of each nation's PPF to suggest that such a shift also changes a nation's production decisions, but this has been applied arbitrarily and no particular values have been assigned.

K Mira: PPF
in millions

25

137.5   C

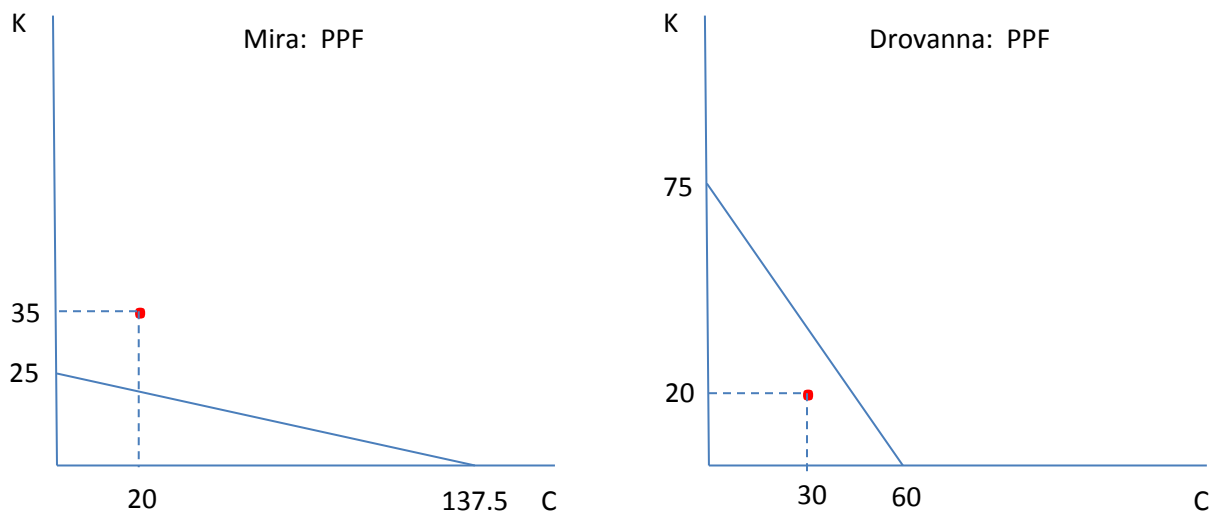K Drovanna: PPF
in millions

75

60   C

Having identified how much each nation might keep for domestic consumption and how much they might choose to export, we can also say something about the relative prices at which each nation values these goods. We assumed that Drovanna exported 35,000,000 K to Mira and that Mira exchanged this for 67,500,000 C; this suggests that each nation values 35,000,000 K equally to 67,500,000 C. If we assume that the price of C is 1 ($P_C = 1$) we can then say that the price of K = $\frac{67,500,000}{35,000,000}$ (C) = 1.93, so if $P_C = 1$, then $P_K = 1.93$. We did this using the same method as used to identify the opportunity cost of C and K when considering **Comparative Advantage**.

The PPF: Efficiency and Feasibility

Finally, let's consider the import of the PPF. A nation's production is bound by its PPF; that is, ceteris paribus, it can't produce beyond the PPF and its ability to provide for its citizens in autarky is likewise bound. So any activity that can extend the PPF or allow a nation to provide more for its citizens is beneficial. If a nation enters into trade and deploys the resulting gains for the benefit of its citizens then this certainly has a positive effect. Likewise, if a nation keeps some of its capital for use in future production, then this renders the nation more productive in future periods and pushes out the PPF – also positive.

Any level of production that falls on a nation's PPF is considered efficient and feasible – including when the nation uses all of its productive capacity to manufacture a good for which it has a CA and then exports some part of that good to another economy. But if the nation chooses to produce below its PPF, this is considered inefficient, though it may be feasible it represents underutilization of the nation's productive capacity (such as unemployment or idle factories).

Production Possibility Frontiers of Mira and Drovanna in Autarky

The above PPFs simply represent the production possibilities of each of these two economies in autarky. Without trade these nations must restrict their production, and thereby their consumption to points on these curves. For example, Mira could not consume 35 K and 20 C; it simply is beyond its productive capacity – it is not **feasible** and we may even say that it is not possible depending on its other constraints. Further, Drovanna should not produce 20 units of K and 30 units of C; it is well beneath its productive capacity and is not **efficient**.

At this point we should also note that each of these nations have a population to support and we can presume that in the absence of trade they produce consumables (C) at the level necessary to support their population and then put the remainder of their productive capacity into the production of capital (K). We understand that when a nation puts its excess productive capacity into the manufacture of K, or capital goods, these goods are employed in future periods to assist with the production of consumables (C) and capital (K). In the abstract, nations have only two factors of production, labor and capital, and capital is employed in an effort to improve the productive output of labor – or the efficient use of capital makes it easier for labor to be productive.

A nation, like Drovanna, that is able to invest so much of its productive capacity in the manufacture of capital (K) is able to expand its PPF rapidly, whereas a nation like Mira, though clearly able to invest in capital, is only able to do so at a modest level compared to Drovanna while engaged in producing sufficient consumables to support its people. Simply by looking at the PPF of these nations we would label Drovanna a highly developed, wealthy nation and we would label Mira a modestly developing nation with limited wealth; neither would be considered a poor nation or one that is in the category of LDC (least developed country).