
International Economics

Lecture Notes

© Prof. Dr. Stephan Huber
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This script aims to support my lecture at the HS Fresenius. It is incomplete and no substitute for taking actively part in class. Do not distribute without permission. I am thankful for comments and suggestions for improvement.

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Preface

- Questions, comments, and suggestions are welcome.
- You can contact (at every time) me in the lecture or via
 - phone (+49 221 973199-523),
 - e-mail (Stephan.Huber@hs-fresenius.de), or
 - in office (4b OG-1 Bü01).
- Material such as slides and lecture notes can be found on ILIAS.
- Workload: 62.5 h = 28 h (in-class) + 34.5 h (self-study)
- Credit Points: 5 (overall)
- Assessment: written exam
- Requirements for the Award of ECTS Points: A pass in this module is achieved when the overall grade is greater than or equal to 4.0.
- Learning Outcomes:
Students recall the quintessence of relevant trade theories and their empirical implications. They can distinguish between different regimes of exchange rates and identify the causes of international financial crises. Students are in a position to describe different approaches to international trade policy and know relevant institutions of international trade and economic integration. They can compare the consequences of globalization for different sectors and regions as well as the different arguments of advocates and opponents of globalization. Students are able to interpret relevant country-level data on international trade.
- This lecture cannot cover all aspects of international economics. However, it is a selection of important concepts to understand the basic functioning of international trade. For a deeper understanding, I recommend to read a standard international economics textbook of your choice. Here is an incomplete list of books I can recommend:
 - [Suranovic \(2012\)](#): Suranovic, S. (2012). *International Economics: Theory and Policy*. Saylor Foundation, 1.0 edition. https://saylordotorg.github.io/text_international-economics-theory-and-policy/index.html [Online; accessed 20-November-2022]
 - [Krugman et al. \(2017\)](#): Krugman, P. R., Obstfeld, M., and Melitz, M. J. (2017). *International Economics: Theory and Policy*. Prentice Hall, 11 edition
 - [Feenstra and Taylor \(2017\)](#): Feenstra, R. C. and Taylor, A. M. (2017). *International Economics*. Worth, 4 edition
 - [Pugel \(2015\)](#): Pugel, T. A. (2015). *International Economics*. McGraw-Hill, 16 edition
 - [Carbaugh \(2016\)](#): Carbaugh, R. (2016). *International Economics*. South-Western, 16 edition
 - [van Marrewijk \(2012\)](#): van Marrewijk, C. (2012). *International Economics: Theory, Application, and Policy*. Oxford University Press, 2 edition

– [van Marrewijk \(2017\)](#): van Marrewijk, C. (2017). *International Economics: Theory, Application, and Policy*. Oxford University Press

- I present International Economics divided into three major branches:

International trade is concerned with the determination of relative prices and real incomes in international trade abstracting from the intervention of money. That means trade is considered as an exchange of goods with no financial transactions involved. Of course, this assumption is unrealistic. However, it helps to understand the driving forces of real-world problems.

Monetary international economics explicitly considers the meaning of the international financial transaction.

International trade policy is about how international economics is taken into action to build the world we live in.

- My teaching principle is **KISS** which stands for **keep it simple and straightforward**.

The KISS principle states that most systems work best if they are kept simple rather than complicated; therefore, simplicity should be a key goal in design, and unnecessary complexity should be avoided.

However, KISS does not mean that the course is easy! If you are not able to think logically or if you are not willing to work hard, you may have problems passing the course

Given your talent and mental capacities, I try to maximize your ability and self-confidence to solve future problems (in life and work).

- I am convinced that reading the lecture notes, preparing for class, taking actively part in class, and trying to solve the exercises without going straight to the solutions is the best method for students to
 - maximize leisure time and minimize the time needed to prepare for the exam, respectively,
 - getting long-term benefits out of the course,
 - improve grades, and
 - have more fun during lecture hours.

- **Notes on Economic models:**

In the following sections, I introduce some mathematical economic models and concepts that are helpful to think about international trade in a structured way. Moreover, knowledge on these concepts will allow you to read up-to-date textbooks and literature in the field of international economics. Last but not least, the concepts, i.e., formulas and graphical visualizations of arguments can be helpful to understand, analyze, and memorize more complex situations of international trade.

Economic models are based on transparent assumptions and generally consist of a set of equations that describe a theory of economic behavior. A good model should provide useful insights into how rational agents behave and how the economy works. Unfortunately, sometimes students feel lost with these models as the models draw on mathematics and rigorous logical thinking. I often hear that there are less sophisticated ways to formulate the argument. While that may sometimes be true, I am deeply convinced that the formal way to introduce international economics is the best way in the medium and long term. Let me justify my conviction:

1. The narrative method, i.e., telling stories and listing bullet points, is an efficient way to quickly inform about different types of topics, but it also has drawbacks: Students easily get lost in intuitive-sounding anecdotes without learning to think critically and identify

underlying general driving forces. Students tend to cram the information told just for the exam and quickly forget everything afterward.

2. Compared to an anecdote, a formal model is not necessarily true. However, they can provide more insight into a topic than an anecdote or other type of storytelling.
3. A formal model is usually more flexible compared to stories and anecdotes. Once students understand the underlying logic of a model and are able to interpret and evaluate its meaning, they can apply the findings to a variety of circumstances or problems. An anecdote, on the other hand, is just a story that may represent a limited view of a problem. Overall, drawing general conclusions and analogies from anecdotal evidence is problematic.
4. A mathematical economic model is like a proof of an argument. It states exactly under what assumptions an argument is true. In a narrative, it is often difficult to see the underlying assumptions and premises of an argument.
5. The formal way of reasoning about things is the standard in economic research, and therefore by knowing the basic concepts, students can read and understand the current literature to do research and solve problems in their professional lives.
6. Once students understand an economic model, they know the underlying relationships, which they are less likely to forget. In other words, **a formal model ensures that students are not just repeating the teacher's words, but are able to think and reason for themselves.**

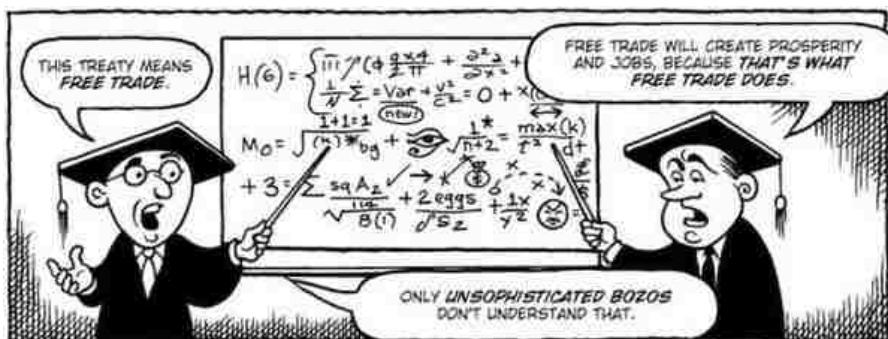


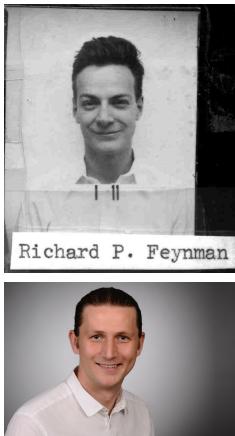
Figure 1: How to be a bad teacher of international economics

Plan

This plan may change. Please try to solve the exercises that we do not discuss in the lecture by your own. I highly recommend trying to solve all exercises without looking on the given solutions.

Week	Lecture	Tutorial and/or Self-Study
1	Preface, chapter 1	📝 exercises: 1.1, 1.2, 1.3, 1.4
2	section 2.1, section 2.2	📝 exercises: 2.1, 2.2
3	section 2.3	📝 exercises: 2.3, 2.4, 2.5, 2.7
4	section 2.5	
5	section 3.1 – section 3.3	📝 exercises: 3.1, 3.2, 3.3, 3.4
6	section 3.4	📝 exercise: 3.5, 3.6
7	section 3.5	📝 exercises: 3.6, 3.7, 3.8
8	section 3.6	📝 exercises: 3.9
9		📝 exercises: 3.12 – 3.16
10	section 3.7	📝 exercises: 3.17 – 3.20
11	section 4.1 – section 4.6	📝 exercises: 4.1, 4.2, 4.3
12	section 4.7 – section 4.11	📝 exercises: 4.4, 4.5
13/14	Exam preparation, Q&A	📝 past exams

How to prepare for the exam



Richard P. Feynman:

"I don't know what's the matter with people: they don't learn by understanding; they learn by some other way by rote, or something. Their knowledge is so fragil!"

Stephan Huber:

I agree with Feynman: The key to learning is understanding. However, I believe that there is no understanding without practice, that is, solving problems and exercises by yourself with a pencil and a blank sheet of paper without knowing the solution in advance.

- Study the lecture notes, i.e., try to understand the exercises and solve them yourself.
- Study the exercises, i.e., try to understand the logical rules and solve the problems yourself.
- Test yourself with past exams that you will find on ILIAS. The structure of the exam is more or less the same every semester.
- If you have the opportunity to form a group of students to study and prepare for the exam, make use of it. It is great to help each other, and it is very motivating to see that everyone has problems sometimes.
- If you have difficulties with some exercises and the solutions shown do not solve your problem, ask a classmate or contact me. I will do my best to help.
- Past exams are available here: <https://github.com/hubchev/courses/tree/main/exams> Just download the compressed file *past_exams.zip* and decompress it with the password *happy_exam*.

Chapter 1

Introduction

Questions of international trade:

- Why do nations trade?
- What do they trade?
- What is the effect of trade policies on trade and welfare?
- Can trade in goods substitute for factor mobility?
- Is free trade better than autarky?
- What are the effects of trade on income distribution?
- If there are winners and losers of trade liberalization, can the former compensate the latter?
- If nations gain from trade, how are the gains distributed?
- What are the welfare effects of various trade policies?

Exercise 1.1 — Trade and Putin

(Solution → p. ??)

Discuss the following quote in the context of the war of Russia against the Ukraine.

“International trade and international capital flows link national economies. Although such links are considered to be beneficial for the most part, they produce an interdependence that occasionally has harmful effects. In particular, shocks that emanate in one country may negatively impact trade partners.” —[Helpman and Itskhoki \(2010\)](#)

1.1 What is international trade?

International trade is the exchange of capital, goods, and services across international borders or territories.

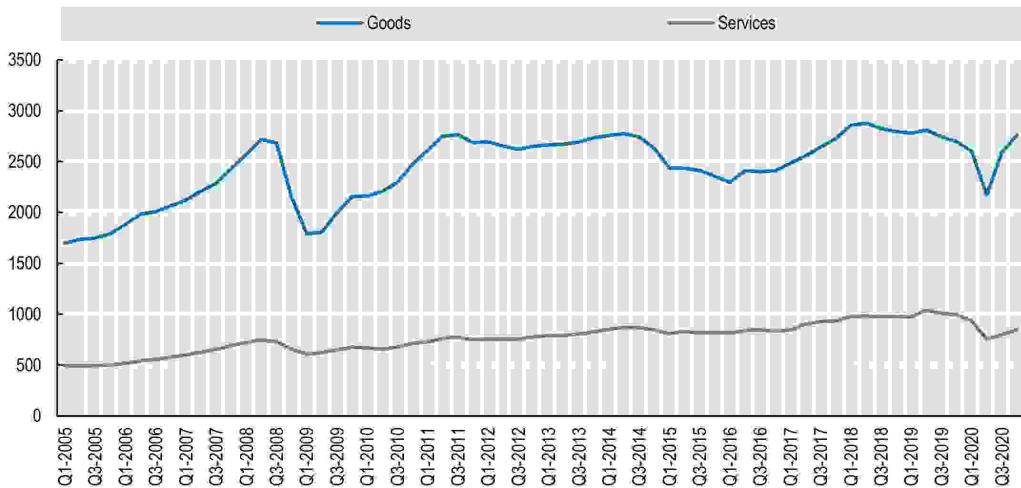


Figure 1.1: Imports and exports in USD billion, OECD countries

Source: [Arriola et al. \(2021\)](#)

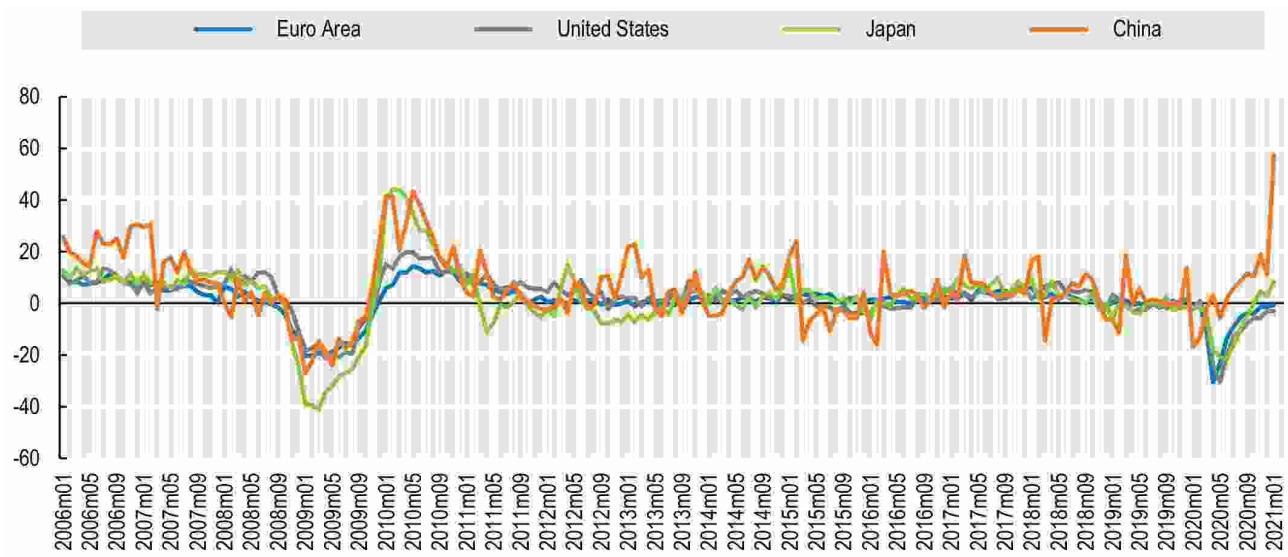


Figure 1.2: Year-on-year growth rates of export volumes

Source: [Arriola et al. \(2021\)](#)

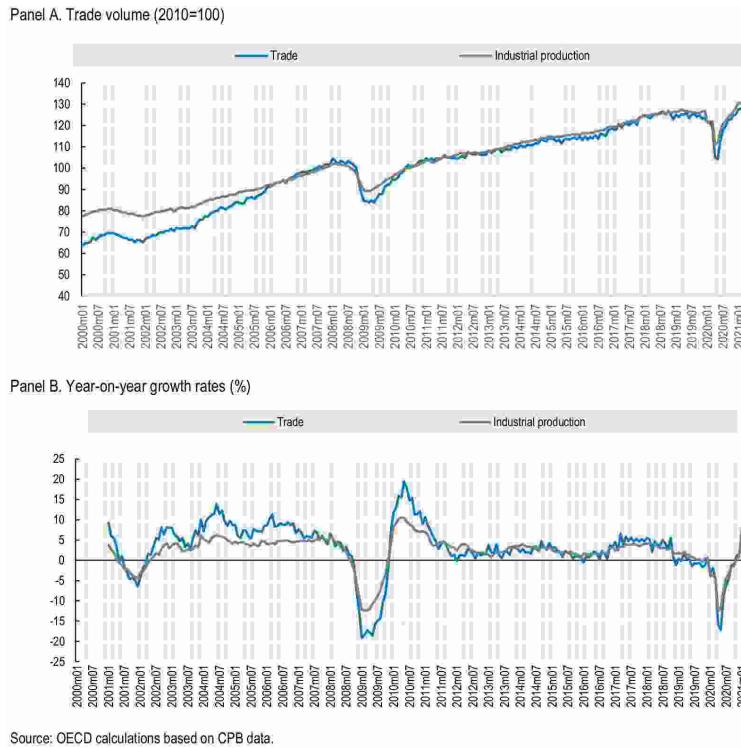


Figure 1.3: World merchandise trade and industrial production volumes
2010=100, seasonally adjusted
Source: Arriola et al. (2021)

1.2 What is international monetary economics?

International monetary economics is about the financial aspects of international trade. It studies the flows of money across countries and the resulting effects on their economies as a whole.

Date: October 2021

Lira Tumbles to Record Low After Central Bank Cuts Rates Again

By Burhan Yıldırım +Follow
21 Oktober 2021, 13:08 MESZ

A customer exchanges US dollars at a currency exchange bureau in Istanbul. (Photographer: Alireza Zareipour)

Source: Bloomberg.com

Turkish lira hits record low after Erdogan threatens foreign diplomats with 'persona non grata' status

PUBLISHED: MON, OCT 25 2021 7:00 AM EDT | UPDATED: MON, OCT 25 2021 11:22 PM EDT

Natalie Yilmaz @natalieyilmaz

Source: CNBC.com

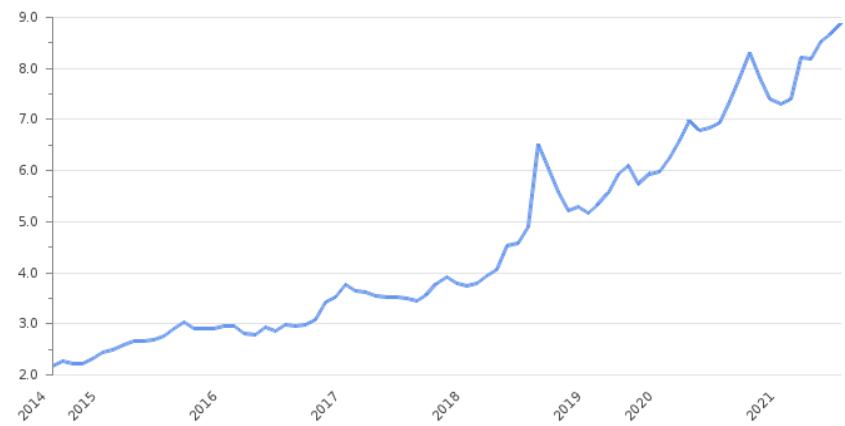


Figure 1.4: TRY to USD rate ($\text{₺}/\$$)
Source: take-profit.org

1.3 What is international trade policy?

International trade policy encompasses the interplay of national interests affecting trade across national borders. The assumption here is that a country's international trade policy serves the interests of its citizens and companies.

Date: 03/03/2018

Juncker responds to Trump's trade tariffs: 'We can also do stupid'

 COMMENTS

By Euronews · Updated 03/03/2018

European Commission chief Jean-Claude Juncker has vowed to fight back against US President Donald Trump's threat of a 25% tariff on steel and 10% on aluminium imports.

"So now we will also impose import tariffs. This is basically a stupid process, the fact that we have to do this. But we have to do it. We will now impose tariffs on motorcycles, Harley Davidson, on blue jeans, Levis, on Bourbon. We can also do stupid. We also have to be this stupid," he said in Hamburg on Friday evening.

While Trump may be comfortable with the idea of a trade war, it wasn't just across the Atlantic where the leader's plans ruffled feathers.

"We are impressing upon the American administration the unacceptable nature of these proposals that are going to hurt them every bit as much as they will hurt us," said Canadian Prime Minister Justin Trudeau.

The warnings from leaders around the world mirrored those of the International Monetary Fund, which said Trump's plan would cause damage both internationally and within America itself.

Trump however remains defiant, insisting that trade wars are good and easy to win."

Source:  [euronews.com](#)

Date: 7/25/2018

Donald Trump and Jean-Claude Juncker talk trade tariffs

The leaders agreed to work toward "zero tariffs" between the US and the EU, which would decisively reverse the slew of trade tariffs imposed recently. The deal involves the EU purchasing natural gas from the US.

Source:  [YouTube](#)



Source:  [dw.com](#)

Exercise 1.2 — Milton Friedman's pencil parable

(Solution → p. ??)



Milton Friedman (1912–2006) one of the great economists (and teachers) of the 20th century had a 10-hour PBS broadcast series in 1980 called *Free to Choose*. In this show, he presented his vision of how free markets work. In a clip from the show he distills his arguments into a parable about a pencil (Actually, the parable goes back to Leonard E. Read, see: <https://fee.org/resources/i-pencil/>)

- ▶ Watch: www.youtube.com/watch?v=67tHtpac5ws, or read
- ✍ the transcript of the video:

“Look at this lead pencil. There’s not a single person in the world who could make this pencil. Remarkable statement? Not at all. The wood from which it is made, for all I know, comes from a tree that was cut down in the state of Washington. To cut down that tree, it took a saw. To make the saw, it took steel. To make steel, it took iron ore. This black center—we call it lead but it’s really graphite, compressed graphite—I’m not sure where it comes from, but I think it comes from some mines in South America. This red top up here, this eraser, a bit of rubber, probably comes from Malaya, where the rubber tree isn’t even native! It was imported from South America by some businessmen with the help of the British government. This brass ferrule? [Self-effacing laughter.] I haven’t the slightest idea where it came from. Or the yellow paint! Or the paint that made the black lines. Or the glue that holds it together. Literally thousands of people co-operated to make this pencil. People who don’t speak the same language, who practice different religions, who might hate one another if they ever met! When you go down to the store and buy this pencil, you are in effect trading a few minutes of your time for a few seconds of the time of all those thousands of people. What brought them together and induced them to cooperate to make this pencil? There was no commissar sending … out orders from some central office. It was the magic of the price system: the impersonal operation of prices that brought them together and got them to cooperate, to make this pencil, so you could have it for a trifling sum. That is why the operation of the free market is so essential. Not only to promote productive efficiency, but even more to foster harmony and peace among the peoples of the world.”

Exercise 1.3 — Free trade: good or bad?

(Solution → p. ??)

Please consider the following figures as well as the short video/text below and discuss whether trade is something ‘good’ or ‘bad’.

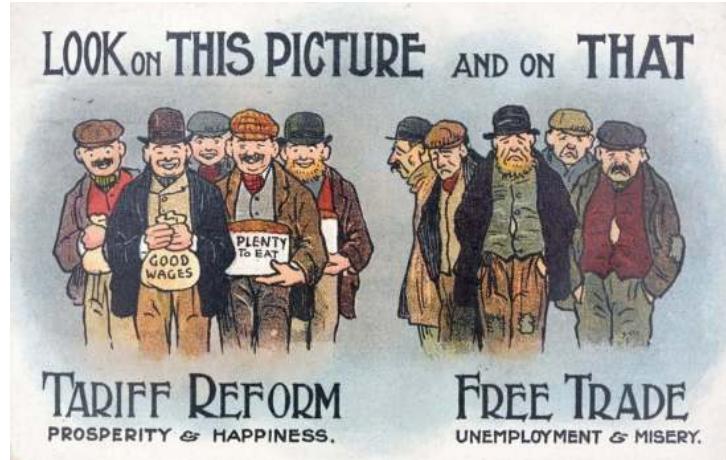


Figure 1.5: Tariffs for prosperity and happiness

Source: https://cdn.shopify.com/s/files/1/0895/0864/products/42-26642856_1024x1024.jpeg?v=1451729228



Figure 1.6: Support tariff reform

Source: <https://i.redd.it/7ede6gxpos131.png>



"You drive a Japanese car, drink French wine, eat Chinese food, own an American computer, buy Canadian lumber and vacation in Mexico. How can you be AGAINST free trade?!"

Figure 1.7: How can we be against free trade?

Source: https://www.cartoonstock.com/directory/f/free_trade.asp



Exercise 1.4 — A country is not a company

(Solution → p. ??)

Read Krugman (1996) which is also available online:
<https://hbr.org/1996/01/a-country-is-not-a-company>

<https://hbr.org/1996/01/a-country-is-not-a-company>



Trump calls for New York Times to fire economist Paul Krugman in the latest escalation of their longtime feud



Source: www.businessinsider.com

Discuss why Trump may not like Krugman's expertise on international trade and comment on Krugman's quote:

"The next time you hear business people propounding their views about the economy, ask yourself. Have they taken the time to study this subject? Have they read what the experts write? If not, never mind how successful they have been in business. Ignore them, because they probably have no idea what they are talking about."

1.4 Important terms (glossary)

The following definitions are taken from Wikipedia:

trade: Trade involves the transfer of goods or services from one person or entity to another often in exchange for money. Economists refer to a system or network that allows trade as a market.

international trade: International trade is the exchange of capital, goods, and services across international borders or territories.

export An export in international trade is a good or service produced in one country that is bought by someone in another country. The seller of such goods and services is an exporter; the foreign buyer is an importer

import An import in the receiving country is an export from the sending country. Importation and exportation are the defining financial transactions of international trade.

balance of trade The balance of trade, commercial balance, or net exports (sometimes symbolized as NX), is the difference between the monetary value of a nation's exports and imports over a certain time period.

trade deficit/surplus If a country exports a greater value than it imports, it has a trade surplus or positive trade balance, and conversely, if a country imports a greater value than it exports, it has a trade deficit or negative trade balance.

balance of payments The balance of payments, also known as balance of international payments and abbreviated B.O.P. or BoP, of a country is the record of all economic transactions between the residents of the country and the rest of the world in a particular period of time (e.g., a quarter of a year). These transactions are made by individuals, firms and government bodies. Thus the balance of payments includes all external visible and non-visible transactions of a country. It is an important issue to be studied, especially in international financial management field, for a few reasons.

trade barrier Trade barriers are government-induced restrictions on international trade.

tariff A tariff is a tax on imports or exports between sovereign states. It is a form of regulation of foreign trade and a policy that taxes foreign products to encourage or safeguard domestic

industry. Traditionally, states have used them as a source of income. Now, they are among the most widely used instruments of protectionism, along with import and export quotas.

trade war A trade war is an economic conflict resulting from extreme protectionism in which states raise or create tariffs or other trade barriers against each other in response to trade barriers created by the other party.

protectionism Protectionism is the economic policy of restricting imports from other countries through methods such as tariffs on imported goods, import quotas, and a variety of other government regulations.

autarky Autarky is the characteristic of self-sufficiency; the term usually applies to political states or to their economic systems. Autarky exists whenever an entity survives or continues its activities without external assistance or international trade.

closed economy If a self-sufficient economy also refuses to conduct any trade with the outside world then economists may term it a ‘closed economy’.

production–possibility frontier curve A production–possibility frontier (PPF) or production possibility curve (PPC) is a curve which shows various combinations of the amounts of two goods which can be produced within the given resources and technology/a graphical representation showing all the possible options of output for two products that can be produced using all factors of production, where the given resources are fully and efficiently utilized per unit time.

indifference curve In economics, an indifference curve connects points on a graph representing different quantities of two goods, points between which a consumer is indifferent. That is, any combinations of two products indicated by the curve will provide the consumer with equal levels of utility, and the consumer has no preference for one combination or bundle of goods over a different combination on the same curve.

utility Within economics, the concept of utility is used to model worth or value. Its usage has evolved significantly over time. The term was introduced initially as a measure of pleasure or satisfaction within the theory of utilitarianism by moral philosophers such as Jeremy Bentham and John Stuart Mill. The term has been adapted and reapplied within neoclassical economics, which dominates modern economic theory, as a utility function that represents a consumer’s preference ordering over a choice set. It is devoid of its original interpretation as a measurement of the pleasure or satisfaction obtained by the consumer from that choice.

Chapter 2

Monetary international economics

2.1 The foreign exchange market

Learning goals

- Interpret exchange rates and relate their changes with relative prices of countries goods.
- Predict the impact of exchange rate changes on national economies.
- Understand the linkage of interest rates and inflation in open economies.
- Explain the interest rate parity condition and the purchasing power parity assumption.

2.1.1 Motivation



Figure 2.1: Trump doubles metal tariffs on Turkey by 20%
Source: Twitter

Do you understand the logic behind Mr. Trump's order to double metal tariffs due to a fall of the Turkish Lira?

2.1.2 Exchange rates

The price of one currency in terms of another is called an exchange rate. Exchange rates allow to compare prices of goods and services across countries. Exchange rates determine a country's relative prices of exports and imports.

Lets name ϵ the home currency and ₺ the foreign currency, then

$$E^{\frac{\epsilon}{\text{₺}}} = \frac{X\epsilon}{Y\text{₺}}$$

is the exchange rate in direct quotation (Preisnotierung) and

$$E^{\frac{\text{₺}}{\epsilon}} = \frac{Y\text{₺}}{X\epsilon}$$

is the exchange rate in indirect quotation (Mengennotierung).

Conventions to talk about exchange rates:

- “*Euro to Dollar*” means €/\$ (This is especially confusing and it can also be understood the other way round but the first currency mentioned is *usually* interpreted as the numerator)
- “*Euro per Dollar*” means €/\$
- “*Euro in Dollar*” means \$/€
- “*1 Euro costs X Dollars*” means X (\$/€)

Both rates contain the same information, but have different interpretations:

- $E^{\frac{\text{€}}{\text{₺}}}$ tells that we have to give X € to receive Y ₺, whereas
- $E^{\frac{\text{₺}}{\text{€}}}$ tells that we have to give Y ₺ to receive X €.

Alternative interpretations:

- $E^{\frac{\text{₺}}{\text{€}}}$ tells that we have to give $\frac{X}{Y}$ € to receive 1 ₺, whereas
- $E^{\frac{\text{€}}{\text{₺}}}$ tells that we have to give $\frac{Y}{X}$ ₺ to receive 1 €.

Eureka 2.1 — Appreciation / Depreciation

A currency can appreciate or depreciate relative to other currencies.

- If the € appreciates, $E^{\frac{\text{₺}}{\text{€}}}$ decreases and $E^{\frac{\text{€}}{\text{₺}}}$ increases.
- If the € depreciates, $E^{\frac{\text{₺}}{\text{€}}}$ increases and $E^{\frac{\text{€}}{\text{₺}}}$ decreases.

2.1.3 Relative prices

- How much ‘value’ do I have to give to receive a ‘value’ from abroad?
- Assume the home country produces beer and the foreign country produces wine. Further assume you want to exchange a beer for wine, then the relative price gives the amount of beer you have to give to receive a unit of wine (in the direct quotation), or the amount of wine you receive for a unit of beer (indirect quotation).
- A relative price of 1 can mean, for example, that you can exchange 1 litre of beer with 1 litre of wine. However, we could also assume that beer is measured in cans of 500ml each and wine in 1 litre bottles. Then, the relative price would be

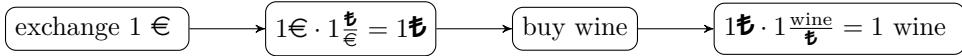
$$P_{\text{wine}}^{\text{beer}} = \frac{2 \text{ beer}}{1 \text{ wine}}.$$

That means, you can convert 2 cans of beer for one bottle of wine.

- If the relative prices increase, I must give more beer to receive a wine.
- If the relative prices decrease, I must give less beer to receive a wine.

2.1.4 Exchange rates and relative prices

- Relative prices are (directly) determined by exchange rates.
- To proof this statement, assume an exchange rate of 1, $E^{\frac{\text{₺}}{\text{€}}} = E^{\frac{\text{€}}{\text{₺}}} = 1$ and that a litre of beer costs 1 € at home and a wine costs 1 ₺ abroad.
- Thus, I can buy both a wine or a beer for 1 €. Due to the fact that I must pay the wine producer with ₺, I must exchange the € beforehand. The process goes like this:



- Now, assume that the € appreciates and the exchange rate becomes $E^{\frac{\text{₺}}{\text{€}}} = 0.5$ and $E^{\frac{\text{€}}{\text{₺}}} = 2$, respectively.



- Indeed, exchange rates determine the relative prices. If the home currency appreciates (depreciates), buying goods and services abroad becomes relatively cheaper (more expensive).
- Of course, if many people now buy wine and aim to convert € to ₺, this may impact the exchange rate and the price of wine. We come back to that later.

Eureka 2.2 — Exchange rates and international trade

The exchange rate determines the relative price of commodities across countries. For example, an appreciation of a currency makes commodities more expensive for foreign buyers and in turn makes foreign commodities cheaper for buyers at home.

2.1.5 Trump and relative prices

Let's return to Trump's Twitter message. Steel producers in the US (and with them Donald Trump) are not happy about a strong dollar (and a weak lira), because it makes their products relatively expensive for Turkish buyers and Turkish steel relatively cheap for US consumers. Trump would have two options to change this situation: He could change the exchange rates or the relative prices of goods in different countries. Since it is difficult for him to influence the exchange rate (the central bank is independent), he decided to increase tariffs and thus the price of foreign steel in the United States. However, this has the disadvantage of making U.S. consumers pay more for these goods (and for goods made from and with steel and aluminum), as David Boaz, executive vice president of the Cato Institute, an American libertarian think tank, notes in his response on Twitter, see [Figure 2.2](#).

In addition, it can be argued that the increased tariffs will make the dollar even stronger because buyers who no longer purchase steel in Turkey due to the increased tariffs will no longer seek to exchange U.S. dollars for Turkish lira.

Overall, it can be doubted that raising tariffs is a successful strategy.

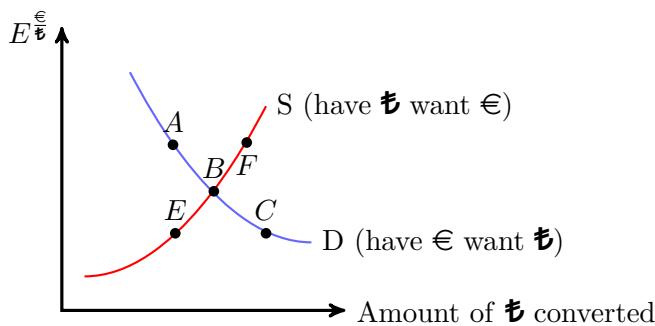


Figure 2.2: Who wins in the end?

Source: Twitter

2.1.6 The foreign exchange market (FOREX)

At a market, people come together to exchange something. In short, everyone offers something to receive something in return. On the FOREX, the players exchange currencies. As in any market, the price is determined by supply and demand (of currencies):



- Assume € is strong, the $E/\text{€}$ is low:
 - Given this low exchange rate, the demand for \$ is high (point C), but the \$ supply is low (point E).
 - Thus, the € is under depreciation pressure $\rightarrow E/\text{€} \uparrow$
- Assume € is weak, the $E/\text{€}$ is high:
 - Given this high exchange rate, the demand for \$ is low (point A), but the \$ supply is high (point F).
 - Thus, the € is under appreciation pressure $\rightarrow E/\text{€} \downarrow$
- B denotes the point where demand and supply meets, that is, the equilibrium exchange rate. In this point, none of those who have \$ want to give more and none of those who have € want to exchange more.

The actors on the FOREX



- Commercial banks: Banks serve as intermediary for their clients (mostly firms) by demanding or supplying foreign exchange.
- Corporations: International exchange of goods and services involves exchange trading to pay for these activities.
- Nonbank financial institutions: Financial institutions such as pension funds are directly trading on the foreign exchange market.
- Central Banks: Depending on the monetary policy, also central banks may intervene on the foreign exchange market.

The vehicle currency

- The average value of traded currencies are about \$5.1 trillion per day (April 2016).¹
- As Figure 2.3 shows, about 30-25% of all currency transactions involve the € and almost 90% of all currency transactions involve the \$.
- For example, assume you want to exchange currency A to B. Now, imagine you can either exchange currency A directly to B, or indirectly by converting currency A to the US-\$ and US-\$

¹See: www.bis.org/publ/rpfx16.htm

to currency B. Then, going the indirect way using the US-\$ as a vehicle can be cheaper, when the direct transaction is more expensive than the two indirect transactions.

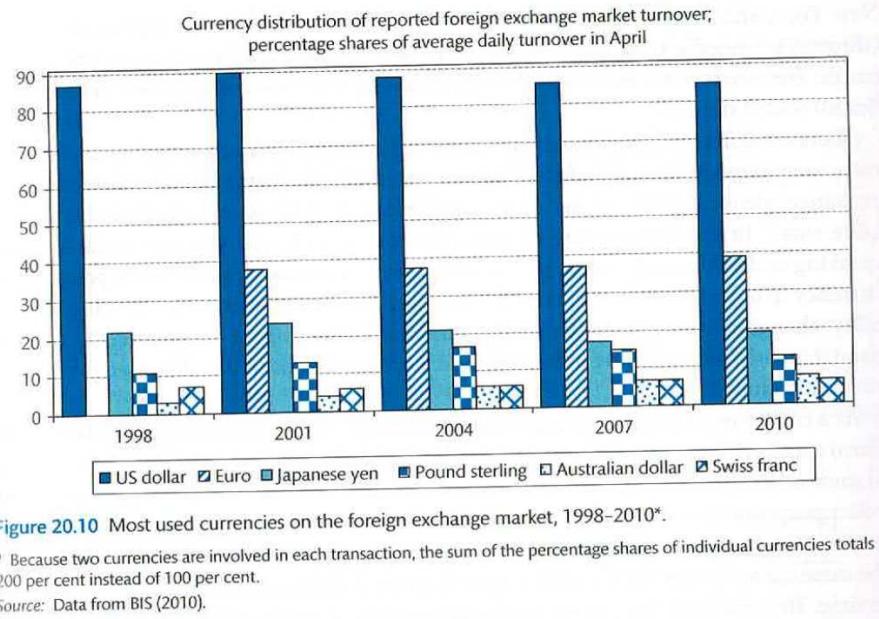


Figure 2.3: Most used currencies
Taken from [van Marrewijk \(2012\)](#), p. 455

2.2 Purchasing power parity assumption

The Purchasing Power Parity (PPP) Assumption is also known as the ‘law of one price’. It says that in competitive markets with zero transportation costs and no trade barriers, identical goods, i , have the same price, P_c^i , all over the world when expressed in terms of the same currency, c .

The idea behind this is that if prices differences would exist, profits could be made through arbitrage, that is, the process of buying a good cheap in country A and selling the good with a profit in country B. This process can quickly equalize real price differences across countries.

However, in the real world, prices differ substantially across countries (see Big Mac Index below) for several reasons. In particular, the strong assumptions of the PPP do not hold, some goods and services are not tradeable and firms might have different degrees of market power across countries.

Big Mac Index The differences of prices across countries can be illustrated with the Economist’s ‘Big Mac Index’. This index measures the price of a Big Mac in different countries expressed in terms of the US-Dollar.

An Big Mac is relatively expensive here:

Switzerland	\$6.57	(6.50 CHF)
Sweden	\$5.83	(51.00 SEK)
United States	\$5.51	(5.51 USD)
Norway	\$5.22	(42 NOK)
Canada	\$5.08	(6.65 CAD)
Euro area	\$4.75	(4.56 EUR)

An Big Mac is relatively cheap here:

Egypt	\$1.75	(31.37 EGP)
Ukraine	\$1.91	(50 UAH)
Russia	\$2.09	(130 RUB)
Malaysia	\$2.10	(8.45 MYR)
Indonesia	\$2.19	(31,500 IDR)
Taiwan	\$2.27	(69 TWD)

Source: <https://github.com/TheEconomist/big-mac-data>, (July 18, 2018)

Exercise 2.1 — Arbitrage

(Solution → p. ??)

- a) Suppose the good "08/15" is tradable across countries at no cost (like software). Suppose further you have \$100 and you see that the prices of the good "08/15" in the three countries differ as follows:

Country	Price of good "08/15"
Germany	\$ 2
Switzerland	\$ 6
United States of America	\$ 6

Explain how you can make money with *international arbitrage*, that is, the practice of taking advantage of price differences of a good across countries. What will happen to the prices once you start making money?

- b) Suppose the good "08/15" is tradable across countries at no cost (like software). Further suppose that your international arbitrage has equalized prices for that good worldwide:

Country	Price of good "08/15"	Price of good "08/15"
Germany	\$ 4	EUR 2
Switzerland	\$ 4	CHF 6
United States of America	\$ 4	

Now, calculate and interpret the exchange rates denoted in $\frac{\$}{\text{€}}$, $\frac{\$}{\text{CHF}}$, $\frac{\text{CHF}}{\$}$, $\frac{\text{CHF}}{\text{€}}$, and $\frac{\text{€}}{\text{CHF}}$.

Exercise 2.2 — Big-Mac-Index vs. Mac-Index

(Solution → p. ??)

- Read  https://en.wikipedia.org/wiki/Big_Mac_Index and discuss the *Big-Mac-Index* critically. Is it really reasonable real-world measurement of purchasing power parity?
- Compare the *Big-Mac-Index* to the *Mac-Index* (see:  <https://themacindex.com/>) looking for price differences of the *Mac mini M1 256GB*. Why are the price differences for Apple products so much smaller as compared to McDonald's *Big Mac*?

Exercise 2.3 — Big Mac economics

(Solution → p. 26)

Price differences across countries can be illustrated with the *Big Mac Index*. It measures the price of a Big Mac in different countries expressed in terms of the US-Dollar. Here is an excerpt of the index:

Country	Price of 1 Big Mac (in \$)	Price of 1 Big Mac
Germany	\$ 4.70	EUR 3.88
Switzerland	\$ 6.90	CHF 6.16
United States of America	\$ 5.70	

- a) With the information given in the table, calculate the exchange rate of Euros (EUR) to Swiss Franc (CHF). Interpret your result.
- b) Calculate how many Dollars you can buy with 100€. Then, use that dollars to buy Swiss Franc. How many Swiss Franc do you get?

Exercise 2.4 — Brexit and the exchange rate

(Solution → p. ??)

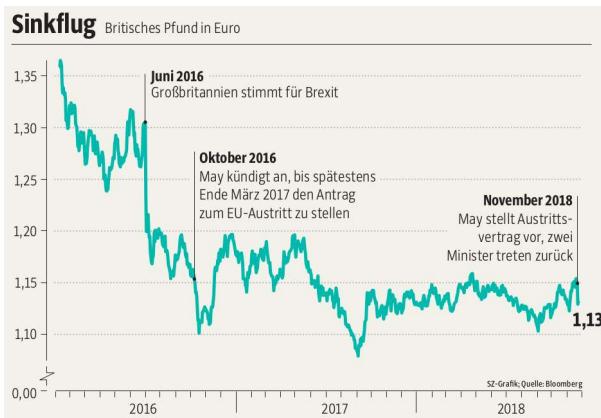


Figure 2.4: The Price of the British Pound ($E^{\frac{\text{£}}{\text{€}}}$)

Source: Süddeutsche Zeitung am Wochenende, 17./18. November 2018, year 74, week 46, No. 265, p. 1 (front page).

Discuss Figure 2.4. Explain how and why the British pound has depreciated since June 2016.

Exercise 2.5 — FOREX MC

(Solution → p. 27)

Multiple Choice! Price differences across countries can be illustrated with the Economist's 'Big Mac Index'. This index measures the price of an Big Mac in different countries expressed in terms of the US-Dollar. Here is an excerpt of the index:

Switzerland	\$6.57	(6.50 CHF)
United States	\$5.51	(5.51 USD)
Canada	\$5.08	(6.65 CAD)
Euro area	\$4.75	(4.56 EUR)
Russia	\$2.09	(130 RUB)

Which of the following statements is true?

- a) The table indicates that the *Purchasing Power Parity Assumption* is fulfilled.
- b) The exchange rate of US-Dollar to Swiss Franc (CHF) is close to one.
- c) The exchange rate of US-Dollar to the Russian Ruble (RUB) is about $62.2 \frac{\$}{RUB}$.
- d) The exchange rate of Canadian Dollar (CAD) to the Euro (EUR) is about 0.73.
- e) With one Canadian Dollar (CAD) you can buy 0.73\$.

Solution to Exercise 2.3 — Big Mac economics

(Exercise → p. 25)

a)

$$\frac{3.88\text{€}}{4.70\$} \cdot \frac{6.90\$}{6.16\text{CHF}} = \frac{6693\text{€}}{7238\text{CHF}} \approx 0.9247 \frac{\text{€}}{\text{CHF}}$$

Thus, the exchange rate of Euros to Swiss Franc is $E^{\frac{\text{€}}{\text{CHF}}} = 0.9247 \frac{\text{€}}{\text{CHF}}$. That means, we have to pay about 92 Cent for one Swiss Franc.

[The exchange rate of CHF to EUR would be: $E^{\frac{\text{CHF}}{\text{€}}} = 1.08142835798596$. That means, you have to give about 1.08 CHF to receive 1 Euro]

- b) Let us assume we have 100 Euro and we want to have Swiss Franc. The exchange rate above would give us

$$\frac{100\text{€}}{0.9247 \frac{\text{€}}{\text{CHF}}} = 100\text{€} \cdot \frac{1\text{CHF}}{0.9247\text{€}} \approx 108.142835798596\text{CHF}$$

Let's proof if that exchange rate is correct: First, let us do the exchange from the Euro to the

vehicle currency, i.e., the Dollar, using the fact that 3.88 Euro are equal to \$4.70:

$$100\text{€} \cdot \frac{4.70\$}{3.88\text{€}} \approx 121.134020618557\$$$

Second, let us do the exchange from Dollar to Swiss Franc using the fact that \$6.90 are equal to 6.16 CHF:

$$121.134020618557\$ \cdot \frac{6.16\text{CHF}}{6.90\$} = 108.142835798596\text{CHF}$$

Thus, the calculated exchange rate of $E^{\frac{\text{€}}{\text{CHF}}} = 0.9247 \frac{\text{€}}{\text{CHF}}$ is correct.

Solution to Exercise 2.5 — FOREX MC

(Exercise → p. 26)

- a) is not correct as the price of a Big Mac in \$ is different across countries.
- b) is correct.
- c) is incorrect: To check whether the statement is correct you need to calculate the following: $2.09\$/130\text{RUB}=0.016(\$/\text{RUB})$. Thus, the statement is false. The interpretation of $0.016(\$/\text{RUB})$ is “1 Ruble costs 0.0160 Dollar”.
- d) is incorrect:

$$\underbrace{\frac{6.65\text{CAD}}{5.08\$}}_{\approx 1.309} \cdot \underbrace{\frac{4.75\$}{4.56\text{€}}}_{\approx 1.0416} \approx 1.36 \frac{\text{CAD}}{\text{€}}$$

- e) is incorrect:

$$\frac{6.05\text{CAD}}{5.08\$} \approx 0.76 \frac{\text{CAD}}{\$}$$

Thus, with one CAD you can buy 0.76\$.

2.3 International investments

2.3.1 Three components of the rate of return

An investment is usually rated by the rate of return and individual preferences². In particular, three components are important to calculate the rate of return:

1. **Interest rate:** An interest rate is the proportion of a loan that is charged to the borrower per period:

$$\underbrace{I_t}_{\text{investment in t}} \cdot \underbrace{(1+i)}_{1+\text{interest rate}} = \underbrace{I_{t+1}}_{\text{payout amount in t+1}}$$

2. **Exchange rate:** An exchange rate is the rate at which one currency can be exchanged to another currency:

$$\underbrace{A}_{\text{value of currency A}} = \underbrace{B}_{\text{value of currency B}} \Leftrightarrow E^{\frac{A}{B}} = \frac{A}{B}$$

3. **Inflation:** Inflation is a quantitative measure of the rate at which the (average) prices (of a basket of representative goods and services) in an economy increase over a period of time. A

²A note concerning preferences: Each investment has different characteristics such as the default risk, opportunities, and liquidity. These characteristics are important to decide which investment is superior. However, we mostly refrain from discussing sophisticated features of investments here.

negative inflation is usually called a deflation.

$$\underbrace{\pi}_{\text{Inflation}} = \frac{\overbrace{P_t}^{\text{Price in t}} - \overbrace{P_{t-1}}^{\text{Price in t-1}}}{P_{t-1}} = \frac{P_t}{P_{t-1}} - 1$$

Eureka 2.3 — Currencies as a store of value

If currencies can appreciate/depreciate over time and/or if inflation is existing, the decision in which currency you store your value and purchasing power, respectively, is important. Thus, whenever you hold a currency you speculate.

2.3.2 Rate of return

The rate of return, r , is calculated as follows:

$$r = \frac{I_t^\epsilon - I_{t-1}^\epsilon}{I_{t-1}^\epsilon} = \frac{I_t^\epsilon}{I_{t-1}^\epsilon} - 1,$$

where I denotes the value of an asset measured in ϵ in the respective time period. Three things can change the value of an asset from $t - 1$ to t :

1. The interest rate, i :

$$I_{t-1} \cdot (1 + i) = I_t$$

2. Storing the value in another currency temporarily, i.e., between $t - 1$ and t :

$$I_{t-1}^\epsilon \cdot E_{t-1}^{\frac{t}{\epsilon}} \cdot E_t^{\frac{\epsilon}{t}} = I_t^\epsilon$$

3. The inflation rate, π :

$$I_{t-1} \cdot (1 + \pi) = I_t$$

Let us now combine the three components to see how the value of an investment changes over time when it is invested in an asset (inflation matters), abroad (exchange rate matters), and in productive capital (interest rate matters):

$$I_{t-1}^\epsilon \cdot (1 + i) \cdot E_{t-1}^{\frac{t}{\epsilon}} \cdot E_t^{\frac{\epsilon}{t}} \cdot (1 + \pi) = I_t^\epsilon. \quad (2.1)$$

By assuming no inflation ($\pi = 0$), we can re-write the equation as

$$I_t = I_{t-1} \cdot (1 + i) \cdot E_{t-1}^{\frac{e}{\bar{e}}} \cdot E_t^{\frac{\bar{e}}{e}} \quad (2.2)$$

$$\Leftrightarrow \frac{I_t}{I_{t-1}} = (1 + i) \cdot E_{t-1}^{\frac{e}{\bar{e}}} \cdot E_t^{\frac{\bar{e}}{e}} \quad (2.3)$$

$$\Leftrightarrow \frac{I_t}{I_{t-1}} = (1 + i) \cdot \underbrace{\frac{E_t^{\frac{\bar{e}}{e}}}{E_{t-1}^{\frac{e}{\bar{e}}}}}_{\text{denote this relation } \alpha} \quad (2.4)$$

$$\Leftrightarrow \underbrace{\frac{I_t}{I_{t-1}} - 1}_{\text{rate of return} \equiv r} = (1 + i) \cdot \alpha - 1 \quad (2.5)$$

$$r = (1 + i) \cdot \alpha - 1 \quad (2.6)$$

$$r = \alpha + i\alpha - 1 \quad (2.7)$$

$$r = \underbrace{\alpha - 1}_{\text{rate of depreciation} = w} + i\alpha \quad (2.8)$$

$$r = w + i + i\alpha - i \quad (2.9)$$

$$r = w + i + i \underbrace{(\alpha - 1)}_{=w} \quad (2.10)$$

$$r = w + i + iw. \quad (2.11)$$

Eureka 2.4 — Simple rule for r

Assuming that the product iw is very small, we can say that the rate of return equals approximately the interest rate plus the rate of depreciation: $r = w + i$.

2.3.3 The interest parity condition

Assume that the rate of return is smaller at home than for an investment abroad. Denoting the foreign country with an asterisk (*), we can write this situation, where it is more profitable to invest money abroad than at home, as follows:

$$r < r_*$$

$$i < w + i_* + i_*w.$$

What would happen if actors in the financial market would find that out?

- The actors would try to convert their home currency to the foreign currency.
- This, in turn, would increase the demand for the foreign currency.
- The foreign currency is now under appreciation pressure and becomes relatively more expensive till it is not more profitable anymore to invest abroad.
- In other words, w is negative so that $r = r_*$ is reached.

Eureka 2.5 — Interest parity condition

The FOREX is in equilibrium when deposits of all currencies offer the same expected rate of return. Thus, in equilibrium the exchange rate, w , assures that the rate of return from the home

country, r , is equal to the rate of return in any foreign country, denoted with an asterisk (*):

$$\begin{aligned}
 r &= r_* \\
 i &= w + i_* + i_* w \\
 \Leftrightarrow i &= i_* + w(i_* + 1) \\
 \Leftrightarrow w &= \frac{i - i_*}{1 + i_*}
 \end{aligned} \tag{2.12}$$

The interest parity condition allows us, to analyze how changes in interest rates and expected exchange rates transmit into changes of exchange rates today by doing comparative static analysis with equation (2.12):

$$\frac{\partial w}{\partial i} > 0; \quad \frac{\partial w}{\partial i_*} < 0.$$

That means,

- if the interest rate of the home country increases, the change in the depreciation rate is positive (\rightarrow the home currency depreciates)
- if the interest rate of the foreign country increases, the change in the depreciation rate is negative (\rightarrow home currency appreciates)

Unpegging the Swiss Franc Until early 2015 the Swiss central bank (SNB) officially aimed to keep the franc over the cap of 1.20 Franc per Euro to protect exporters and ward off deflationary pressure. Unexpectedly, the SNB unpegged the Franc in 2015 which was under appreciation pressure because many investors wanted to store their assets in the Swiss Franc. With the SNB announcement, the exchange rate fell from 1.20 to 1.00 Franc per Euro (E^F_{E}), see Figure 2.5. Almost simultaneously the interest rate also dropped as is shown in Figure 2.6. This is exactly what the interest parity condition predicts.

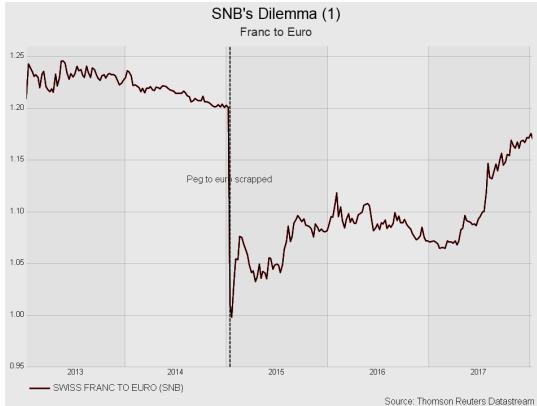


Figure 2.5: The Swiss central bank unpegged the Franc from the Euro

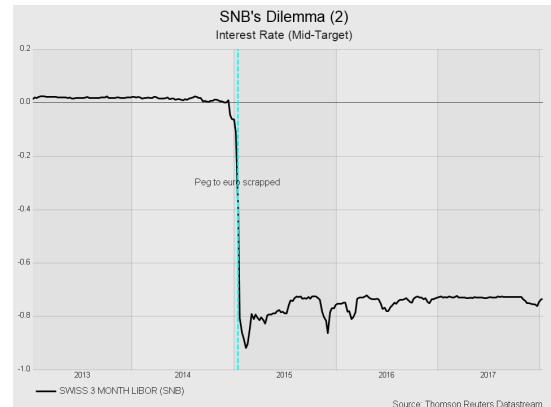


Figure 2.6: The Swiss interest rate

2.3.4 The Fisher effect

Let us recall equation (2.1):

$$I_{t-1}^{\mathbb{E}} \cdot (1 + i) \cdot E_{t-1}^{\frac{t}{\mathbb{E}}} \cdot E_t^{\frac{t}{\mathbb{E}}} \cdot (1 + \pi) = I_t^{\mathbb{E}}$$

Now, assume that the exchange rate is stable over time ($E_{t-1}^{\frac{\epsilon}{\pi}} = E_t^{\frac{\epsilon}{\pi}}$) and that the interest rate is zero ($i = 0$). Then, we can write

$$I_t = I_{t-1} \cdot (1 + \pi) \quad (2.13)$$

$$\Leftrightarrow \frac{I_t}{I_{t-1}} - 1 = (1 + \pi) - 1 \quad (2.14)$$

$$r = \pi \quad (2.15)$$

Eureka 2.6 — Fisher effect

Abstracting from exchange rate movements and interest rate differences, the rate of return is solely determined by the inflation rate and cross-country differences in their rate of return can be described by differences in inflation rates:

$$r_{GER} - r_{TUR} = \pi_{GER} - \pi_{TUR}.$$

This equation is often called the Fisher Effect.

Exercise 2.6 — Exchange rates and where to invest

(Solution → p. 31)

Suppose you want to buy a new car in Germany in one year, i.e., $t=2023$. Today, i.e., $t=2022$, you have €10,000 to invest for one year.

Given the following conditions:

- The annual interest rate in Europe is 1%.
- The annual interest rate in the U.S.A. is 2%.
- One US-Dollar can be converted to €0.93 this year.
- You expect that €1 can be converted to \$1.09 next year.
- Moreover, you expect no inflation in Germany and the U.S.
- No banking fees or alike.

- Calculate the return on an investment in the U.S. and Germany, respectively.
- Do you expect the euro to appreciate or depreciate from 2022 to 2023?

Solution to Exercise 2.6 — Exchange rates and where to invest (Exercise → p. 31)

- Rate of return in the EU is 1 percent and hence you will have €10,100 in 2023.*

Rate of return in the US is about 0.62 percent:

$$10000\text{€} \cdot \frac{1\$}{0.93\text{€}} \cdot 1.02 \cdot \frac{1\text{€}}{1.09\$} = 10062.1485\text{€}$$

Thus, it is better to invest in Europe.

- In 2022 you have to pay 93 Cent for a dollar and in 2023 you expect to pay about 91 Cent for a dollar. Thus, you expect the Euro to appreciate.*

Exercise 2.7 — Turkey vs. Germany

(Solution → p. 32)

You have 100€ this year, $t - 1$, which you like to invest till next year, t .

- Where should you invest, given the following informations:

- The interest rate in Germany is 1%.
- The interest rate in Turkey is 10%.
- 1€ can be converted to 7₺ this year in the FOREX
- You expect that 1 € can be converted to 7.1₺ next year in the FOREX.

- You expect no inflation in Germany and Turkey.
- b) Calculate the exchange rate in period t that makes investing in Germany and Turkey equal profitable.
- c) Explain why the Turkish Lira is under appreciation pressure in t-1.

Solution to Exercise 2.7 — Turkey vs. Germany

(Exercise → p. 31)

a) *Intuition: Looking only on the interest rate, it would be superior to invest in Turkey. Looking only on the development of the exchange rate, however, it would be superior to invest in Germany because the Euro appreciates relative to the Lira from period t-1 to t. Thus, we need to calculate the return on investment in order to see which of the two effects dominates.*

⇒ (Exact) Calculation Method in 4 Steps:

(a) exchange € to ₣ in t-1:

$$100\text{€} \cdot E_{t-1}^{\text{₺}/\text{€}} = 100\text{€} \cdot 7\frac{\text{₺}}{\text{€}} = 700\text{₺}$$

(b) invest in either Germany or Turkey:

$$GER \rightarrow 100\text{€} \cdot (1 + 0.01) = 101\text{€}$$

$$TUR \rightarrow 700\text{₺} \cdot (1 + 0.1) = 770\text{₺}$$

(c) re-exchange ₣ to €:

$$770\text{₺} \cdot E_t^{\text{€}/\text{₺}} = 770\text{₺} \cdot \frac{1\text{€}}{7\frac{1}{10}\text{₺}} = \frac{7700}{71} \approx 108.4507$$

(d) calculate the return on investment, r :

$$r_{GER} = 0.01$$

$$r_{TUR} = \frac{108.4507 - 100}{100} = 0.084507$$

Answer: The return on investment is lower in Germany. Thus, it is superior to invest the 100€ in Turkey.

⇒ (Exact) Calculation Method Alternative:

$$\underbrace{r}_{\text{rate of return}} = \frac{I_t^{\text{€}} - I_{t-1}^{\text{€}}}{I_{t-1}^{\text{€}}}$$

$$\text{with } I_t^{\text{€}} = \underbrace{I_{t-1}^{\text{€}}}_{\text{investment in t-1}} \cdot \underbrace{E_{t-1}^{\text{₺}/\text{€}}}_{\text{exchange rate in t-1}} \cdot \underbrace{(1+i)}_{1+\text{interest rate}} \cdot \underbrace{E_t^{\text{€}/\text{₺}}}_{\text{exchange rate in t}}$$

$$TUR \rightarrow I_t^{\text{€}} = 100\text{€} \cdot 7\frac{\text{₺}}{\text{€}} \cdot (1 + 0.1) \cdot \frac{1\text{€}}{7.1\text{₺}} = 108.4507 \rightarrow r_{TUR} = 0.084507$$

$$GER \rightarrow I_t^{\text{€}} = 100\text{€} \cdot 1 \cdot (1 + 0.01) \cdot 1 = 101\text{€} \rightarrow r_{GER} = 0.01$$

⇒ (Approximative) Calculation Method:

Steps a) to c) can be summarized as two rates of changes:

$$\underbrace{r'}_{\text{approximative rate of return}} = \underbrace{i}_{\text{interest rate}} + \underbrace{w}_{\text{rate of depreciation}}$$

$$\text{with } w = \frac{E_t^{\text{€}/\text{₺}}}{E_{t-1}^{\text{€}/\text{₺}}} - 1$$

$$r'_{GER} = 0.01$$

$$r'_{TUR} = 0.1 + \frac{\frac{10}{71}}{\frac{10}{70}} - 1 = 0.1 + \frac{700}{710} - 1 = 0.1 - \frac{10}{710} = \frac{61}{710} \approx 0.08591$$

- b) Both investments are equal profitable if $r_{GER} = r_{TUR}$. Given all informations in period $t - 1$, the exact exchange rate in period t that makes investments are equal profitable, $E_t^{\text{€}/\text{₺}*}$, is calculated as

follows:

$$I_t^{\epsilon} = I_{t-1}^{\epsilon} E_{t-1}^{\epsilon/\epsilon} (1+i) E_t^{\epsilon/\epsilon}$$

$$\Leftrightarrow E_t^{\epsilon/\epsilon} = \frac{I_t^{\epsilon}}{(I_{t-1}^{\epsilon} E_{t-1}^{\epsilon} (1+i))} = \frac{101}{(100 \cdot 7 \cdot 1.1)} = \frac{101}{770} \approx 0.1311$$

The approximate exchange rate in period t that makes investments equal profitable, $E_t^{\epsilon/\epsilon'}$, is calculated as follows:

$$r_{GER} = i_{TUR} + \frac{E_t^{\epsilon/\epsilon'}}{E_{t-1}^{\epsilon/\epsilon}} - 1$$

$$\Leftrightarrow r_{GER} - i_{TUR} + 1 = \frac{E_t^{\epsilon/\epsilon'}}{E_{t-1}^{\epsilon/\epsilon}}$$

$$\Leftrightarrow E_t^{\epsilon/\epsilon'} = (r_{GER} - i_{TUR} + 1) \cdot E_{t-1}^{\epsilon/\epsilon}$$

$$\Leftrightarrow E_t^{\epsilon/\epsilon'} = (0.01 - 0.1 + 1) \cdot \frac{1}{7} = \frac{91}{100} \cdot \frac{1}{7} = \frac{91}{700} = 0.13$$

Let us proof our results by re-calculating the rate of return for an investment in Turkey with $E_t^{\epsilon/\epsilon'}$ and $E_t^{\epsilon/\epsilon'}$:

$$r'_{TUR} = 0.1 + \frac{\frac{91}{700}}{\frac{1}{7}} - 1 = \frac{637}{700} - 0.9 = 0.01$$

$$I_t^{\epsilon*} = 100\epsilon \cdot 7 \frac{\epsilon}{\epsilon'} \cdot (1+0.1) \cdot \frac{91}{700} \frac{\epsilon}{\epsilon} = \frac{70070}{700} = 100.1$$

$$\rightarrow r_{TUR}^* = 0.01$$

- c) The ϵ must appreciate in $t-1$ since it is more profitable to exchange ϵ to store the asset value in Turkey. That means the demand curve in the FOREX shifts upwards (see figure of Box 2.1.6) till the exchange rate equals the exchange rate that makes both investments equal profitable and hence nobody has an incentive to demand more ϵ for the given exchange rate $E_t^{\epsilon/\epsilon'}$ as calculated above.

2.4 Notes on the international flows of goods and capital

Net exports are the value of domestic goods and services sold abroad minus the value of foreign goods and services sold domestically. **Net capital outflow** is the acquisition of foreign assets by domestic residents minus the acquisition of domestic assets by foreigners. Because every international transaction involves an exchange of an asset for a good or service, an economy's net capital outflow always equals its net exports. An economy's saving can be used to finance investment at home or buy assets abroad. Thus, national saving equals domestic investment plus net capital outflow.

Definition of

- **exports:** goods and services that are produced domestically and sold abroad.
- **imports:** goods and services that are produced abroad and sold domestically.
- **net exports:** the value of a nation's exports minus the value of its imports, also called the trade balance.
- **trade balance:** the value of a nation's exports minus the value of its imports, also called net exports.
- **trade surplus:** an excess of exports over imports.
- **trade deficit:** an excess of imports over exports.
- **balanced trade:** a situation in which exports equal imports.

- **net capital outflow:** the purchase of foreign assets by domestic residents minus the purchase of domestic assets by foreigners.

The flow of capital abroad can take two forms:

- Foreign direct investment occurs when a capital investment is owned and operated by a foreign entity.
- Foreign portfolio investment involves an investment that is financed with foreign money but operated by domestic residents.

Examples

Boeing sells some airplanes to a Japanese airline.

- Boeing gives planes to the Japanese firm, and the Japanese firm gives yen to Boeing. Exports have increased (which raises net exports) and the United States has acquired some foreign assets in terms of yen (which raises net capital outflow).
- Or Boeing may exchange its yen for dollars with another entity that wants yen. Suppose an American mutual fund wants to buy some stock in a Japanese company. In this case, Boeing's net export of planes equals the mutual fund's net capital outflow in stock.
- Or Boeing may exchange its yen with an American firm that wants to buy some good or service from a Japanese company. In this case, the imports will exactly offset the exports, so net exports is zero.

Every international transaction involves exchange. When a seller country transfers a good or service to a buyer country, the buyer country gives up some asset to pay for the good or service. Thus, the net value of the goods and services sold by a country (net exports) must equal the net value of the assets acquired (net capital outflow).

2.5 Balance of payments

Exercise 2.8 — Germany's net exports

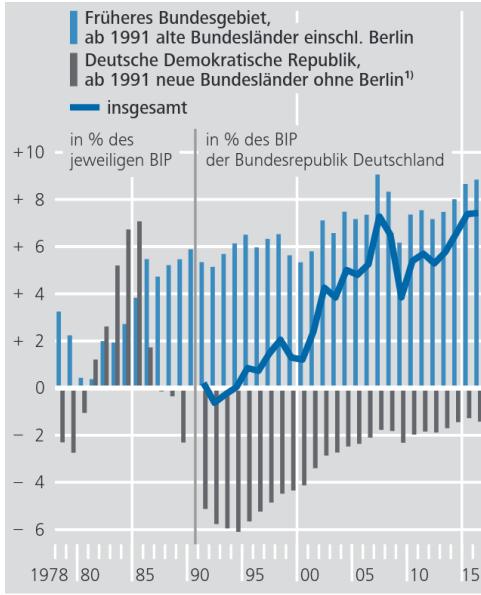
(Solution → p. 34)

Discuss the pros and cons of Germany's net export surplus.

Solution to Exercise 2.8 — Germany's net exports

(Exercise → p. 34)

Please watch:  <https://youtu.be/DE-dXYeFmtg>.



Quelle: Eigene Berechnungen basierend auf den Volkswirtschaftlichen Gesamtrechnungen der Länder und den Ergebnissen der VGR-Revision 2005. Die VGR-Daten für die ehemalige DDR stammen aus: Statistisches Bundesamt (2000). Nettoexporte näherungsweise ermittelt als Differenz aus dem Bruttoinlandsprodukt und den privaten und staatlichen Konsumausgaben sowie den Bruttoanlageinvestitionen. ¹⁾ Angaben für 1990 nicht verfügbar.

Deutsche Bundesbank

Figure 2.7: Germany's Net Export



Figure 2.8: Foreign Assets of Germans

2.5.1 The balance of payments must be balanced!

A country's *Balance of Payments* account (Zahlungsbilanz) records the payments and receipts of its residents in their transactions with residents of other countries. If all transactions are included, the payments and receipts of each country are, and must be, *balanced*. Any apparent inequality simply leaves one country acquiring assets in the others. The *Balance of Payments* account consists of two primary components:

1. The **Current Account** (Leistungsbilanz) which measures a country's trade balance plus the effects of net income and direct payments. In particular, it consists of four components, that are, trade, net income, direct transfers of capital, and asset income.
2. The **Capital Account** (Kapitalbilanz) reflects the net change in ownership of national assets:

$$\text{Capital account} = \text{Change in foreign ownership of domestic assets} \\ - \text{Change in domestic ownership of foreign assets}$$

Ignoring statistical effects, these two subaccounts must sum to zero. Figure 2.9 shows that this appears to be the case for the United States.

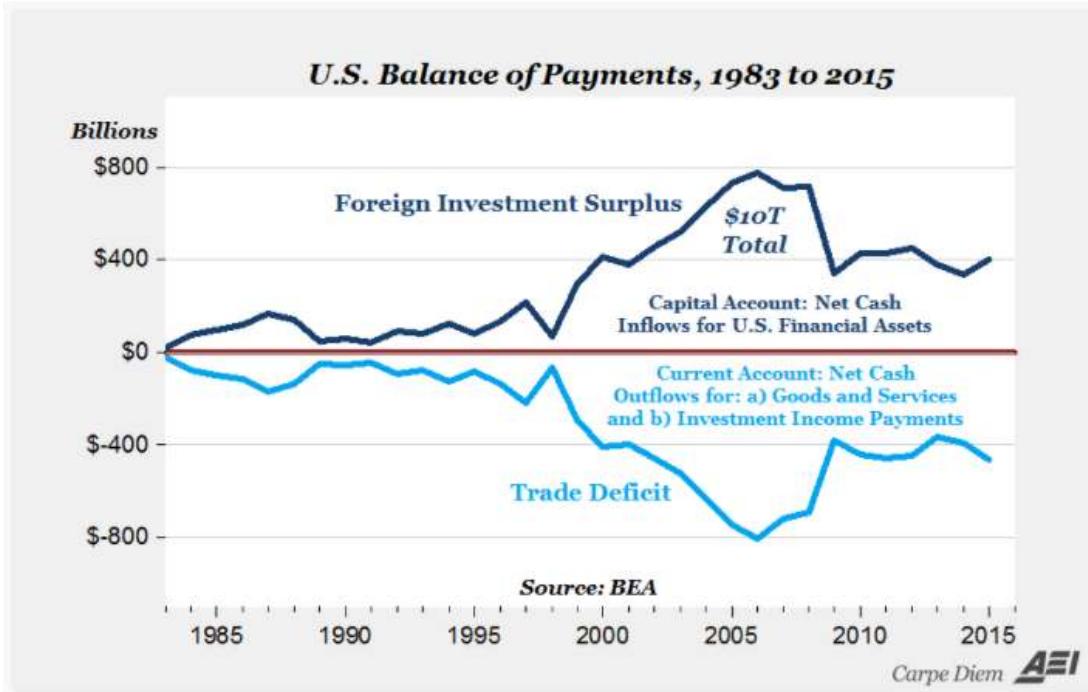


Figure 2.9: U.S. Balance of Payments

Although the totals of payments and receipts are necessarily equal, certain types of transactions give rise to imbalances-surpluses of payments or receipts called deficits or surpluses. Thus, deficits or surpluses can occur in the following areas: Trade in goods (commodities), trade in services, foreign investment income, unilateral transfers (foreign aid), private investment, flows of gold and money between central banks and treasuries, or a combination of these or other international transactions. It should be made clear, however, that these surpluses and deficits must add up to zero, i.e., payments must balance (double-entry bookkeeping!).

For example, if the Americans buy cars from Germany and have no other transactions with Germany, the Germans must end up holding dollars, which they can hold in the form of bank deposits in the United States or in some other U.S. facility. Americans' payments to Germany for automobiles are offset by Germany's payments to U.S. persons and institutions, including banks, for the purchase of dollar assets. In other words, Germany sold automobiles to the United States, and the United States sold dollars or dollar-denominated assets to Germany. Thus, Germany runs a trade surplus meaning its *Trade Balance* (Handelsbilanz) is positive and so is the *Current Account* (Leistungsbilanz), which includes the *Trade Balance*. However, Germany must also have a deficit in the capital account. In other words, more money is flowing out than coming in.

2.5.2 A formal representation

In what follows, I provide a simplified overview of how the world trading system works. I do not go into the pros and cons of running a trade surplus or deficit. This is a topic in itself. However, I do try to provide an understanding of the determinants of current account deficits and surpluses.

Closed economy

In a closed economy, there are three main agents: households, firms, and the government. If we denote C as the consumption of goods and services by households (food, housing, entertainment, ...), G as the purchases by the government (infrastructure, social services, military spending, education, ...), and I as the level of investment by firms (machinery, buildings, research and development, ...), then we can

write total output Y as

$$Y = C + I + G. \quad (2.16)$$

If we define national savings, S , as the share of output not spent on household consumption or government purchases,

$$S \equiv Y - C - G,$$

then the investments, I , must be equal to the savings in a closed (!) economy:

$$S = I,$$

which can easily been shown by rearranging equation (2.16) as follows

$$I = \underbrace{Y - C - G}_{\equiv S}.$$

Open economy

In an open economy, household consumption, government purchases, and firms investments may not be produced in the home economy but may be imported from abroad. Similarly, the home production may be exported to foreign consumers, firms, or governments. Thus, an economy can import and export goods. Denoting imports by IM and exports by EX , we can re-write equation (2.16) as follows:

$$Y = C + I + G + EX - IM \quad (2.17)$$

If an economy exports more than it imports, $EX > IM$, it has a trade surplus. If an economy exports less than it imports, $EX < IM$, it has a trade deficit. The difference between exports and imports can be called net-exports, NEX . That may represent the current account balance (at least, if we abstract from other income and financial transactions). Rearranging equation (2.17) we can write

$$\Leftrightarrow \underbrace{Y - C - G - I}_{\equiv S} = \underbrace{EX - IM}_{\equiv NEX} \quad (2.18)$$

$$\Leftrightarrow S - I = NEX. \quad (2.19)$$

When $I = S$, the share of output not spend on household consumption or government purchases equals the investments and, in turn, the economy has zero net-exports. If an economy, however, has a trade surplus, $NEX > 0$, such as Germany in the last decade, the savings exceeds the investments. That means, the country produces more than it is spending on goods and services. Thus, the savings that are not used domestically, $S - I$, are invested abroad. That means, the country with the trade surplus is acting as a lender to or investor in the rest of the world. The difference $S - I$ hence can be denoted as the net capital outflow, NCO :

$$\underbrace{S - I}_{\equiv NCO} = NEX \quad (2.20)$$

$$NCO = NEX \quad (2.21)$$

Eureka 2.7 — Net exports must be equal to net capital outflow

The accounting identities above simple state that there is a *balance of payments*. The Balance of Payment accounts are based on double-entry bookkeeping and hence the annual account has to be balanced. If an economy has a current account trade deficit (surplus) is offset one-to-one

by a capital account surplus (deficit) to assure a balance of payments. In other words, if an economy wants to import more goods than it produces, it must attract foreign capital being invested at home.

What would happen if the United States, for example, could not attract capital flows from the rest of the world to finance their trade deficit? This would mean that American consumers buy foreign goods with US-Dollars and more US-Dollars are flowing out of the country than coming in. In turn, the supply of US-Dollars is greater than the demand and the US-Dollar would fall in value. This depreciation of the US-Dollar would make US-exports cheaper and imports more expensive and hence the current account deficit would be reduced. However, so far the export deficit of the United States is kind of stable and the US-Dollar does not depreciate substantially. This is probably the reason why President Trump claimed other countries to *manipulate* their currencies, see [Figure 2.10](#). As Trump thinks a trade deficit is bad for the United States, he would like to have a weak dollar³ and low interest rates. A weak dollar makes American products cheap for the rest of the world and has positive effects on exports and negative on imports (see [Heureka 2.2](#)). A low interest rate in the United States would make the country less attractive for foreign capital investments (I would become smaller), i.e., the net capital inflows would decrease and so would the *Capital Account's* surplus (and with it the Current Account deficit would become smaller). In concrete terms, he claims that in particular the Chinese government and the European Central Bank run policies that hold their currencies (Renminbi and Euro) cheap.



Following

Russia and China are playing the Currency Devaluation game as the U.S. keeps raising interest rates. Not acceptable!

5:31 AM - 16 Apr 2018

Figure 2.10: Trump worries about the U.S. trade deficit
Source: Twitter

³I guess he would never put it that way.

Chapter 3

International trade

Plan Trading is usually a free decision of buyers and sellers, and therefore it would not take place if one subject were to lose when the deal is made. Although the logic of this argument is compelling, it is not sufficient to justify free international trade. In the next chapters, we will see that trading must be beneficial to those who trade, can be beneficial to everyone, but does not necessarily have to be beneficial to everyone.

Section 3.1 explains Mankiw's principle that trade can make everyone better off.

Section 3.2 paraphrases the sources of international trade.

Section 3.3 recalls some microeconomic tools that help to explain international economics.

Section 3.4 provides a theoretical framework of trade and shows that under certain circumstances international trade can yield a miserable growth path for a country.

Section 3.5 explains that more trade does not have to be good for a country's wealth.

Section 3.6 introduces the concept of comparative advantage. It claims that trade is due to autarky price differences that stem from country-specific differences such as technology, factor endowments, or taste.

Section 3.7 shows that opening up to free trade generates winners and losers and that countries' endowments with labor and capital determine patterns of trade.

3.1 Trade can make everyone better off



Figure 3.1: N. Gregory Mankiw
Source: <http://scholar.harvard.edu/mankiw/>

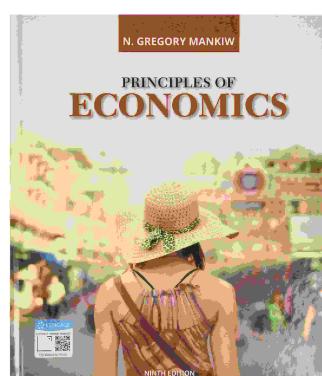


Figure 3.2: N. Gregory Mankiw
Source: [Mankiw \(2020\)](#)

N. Gregory Mankiw (*1958) is one of the most influential economists. In his best-selling textbook *Principles of Economics* (see [Mankiw, 2020](#)) he claims ten principles of economics of which one is entitled *Trade can make everyone better off* which he explains as follows:

“You have probably heard on the news that the Japanese are our competitors in the world economy. In some ways, this is true, for American and Japanese firms do produce many

of the same goods. Ford and Toyota compete for the same customers in the market for automobiles. Compaq and Toshiba compete for the same customers in the market for personal computers.

Yet it is easy to be misled when thinking about competition among countries. Trade between the United States and Japan is not like a sports contest, where one side wins and the other side loses. In fact, the opposite is true: Trade between two countries can make each country better off.

To see why, consider how trade affects your family. When a member of your family looks for a job, he or she competes against members of other families who are looking for jobs. Families also compete against one another when they go shopping, because each family wants to buy the best goods at the lowest prices. So, in a sense, each family in the economy is competing with all other families.

Despite this competition, your family would not be better off isolating itself from all other families. If it did, your family would need to grow its own food, make its own clothes, and build its own home. Clearly, your family gains much from its ability to trade with others. Trade allows each person to specialize in the activities he or she does best, whether it is farming, sewing, or home building. By trading with others, people can buy a greater variety of goods and services at lower cost.

Countries as well as families benefit from the ability to trade with one another. Trade allows countries to specialize in what they do best and to enjoy a greater variety of goods and services. The Japanese, as well as the French and the Egyptians and the Brazilians, are as much our partners in the world economy as they are our competitors” ([Mankiw, 2020](#), p. 8-9)

3.2 Reasons for trade

Before we come to reasons for trade in further detail, let us name five important explanations or reasons why trade takes place between countries. Of course, the list is incomplete.

Differences in technology Advantageous trade can occur between countries if they differ in their technological abilities to produce goods and services. Technology refers to the techniques used to turn resources (labor, capital, land) into outputs. The basis for trade in the Ricardian Model of Comparative Advantage is differences in technology. We will come back to this in [section 3.6](#) in more detail.

Differences in endowments Trade between countries also occur because countries differ with respect to their endowments of resources which refers to the skills and abilities of a country’s workforce, the natural resources available within its borders, and the sophistication of its capital stock such as machinery, infrastructure, and communications systems. The basis for trade in the pure exchange models (see [section 3.4](#)) and the Heckscher-Ohlin Model (see [section 3.7](#)) is differences in resource endowments.

Differences in demand Trade between countries occurs because the demands or preferences differ between countries. Individuals in different countries may have different preferences or demands for various products. The Asian people are likely to demand more rice than Americans, even if facing the same price. Czech and German people may demand more beer, the Dutch more wooden shoes, and the Japanese more fish than Americans, even if they all faced the same prices.

Economies of scale in production The existence of economies of scale in production is sufficient to generate advantageous trade between two countries. Economies of scale refer to a production process in which production costs fall as the scale of production rises. This feature of production is also known

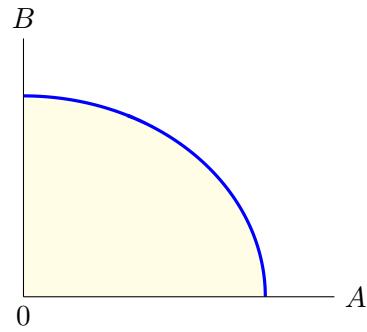
as *increasing returns to scale*. Economics of scale play a huge role in Paul Krugman's *New Trade Theory* which we discuss later.

Existence of Government Policies Government tax and subsidy programs can be sufficient to generate advantages in production of certain products. In these circumstances, advantageous trade may arise solely due to differences in government policies across countries. We will touch the impact of tariffs and regulations in [chapter 4](#).

3.3 Microeconomic preliminaries

3.3.1 Production possibility frontier curve

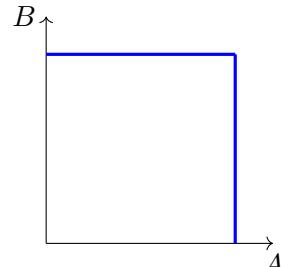
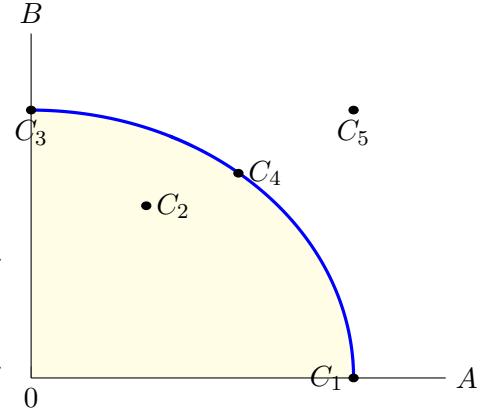
The production possibility frontier curve (PPF) is a graphical representation showing all the possible options of output for two products that can be produced using all the given resources and factors of production are fully and efficiently utilized per unit time. The PPF is the boundary between the combinations of goods and services that can be produced and the combinations that cannot. The PPF is a valuable tool for illustrating the effects of scarcity and its consequences, as it can teach us a lot about production efficiency, opportunity costs, and tradeoffs between different choices. The PPF is (usually) concave because not all resources are equally productive in all activities.



Exercise 3.1 — Understanding production

(Solution → p. 41)

- The figure shows a PPF and five conceivable production points, C_i , where $i \in \{1, \dots, 5\}$. Explain the figure using the following terms: *attainable point*; *available resources*, *unattainable*, *inefficient*, *efficient point*.
- What would happen to the PPF if the technology available in a country and needed for the production process became better?
- What would happen to the PPF if the resources available in a country and needed in the production process of both goods shrank?
- What would happen to the PPF if the resources (technology) available in a country that are needed in the production process...
 - ... for both goods increased (improved)?
 - ... for good A shrank (got worse)?
 - ... for good B increased (improved)?
- Does the shape of the PPF tell us anything about economies of scale in the production process?
- The figure on the right shows an extreme PPF. How can such a PPF be explained?



Solution to Exercise 3.1 — Understanding production

(Exercise → p. 41)

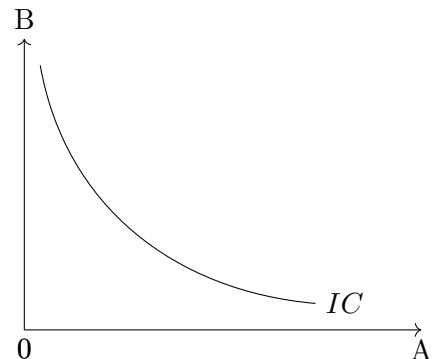
- Any point that lies either on the production possibilities curve or to the left of it is said to be an *attainable point*: it can be produced with currently available resources. Production points that lie in the yellow shaded area are said to be *unattainable* because they cannot be produced

using currently available resources. These points represent an inefficient production, because existing resources would allow for production of more of at least one good without sacrificing the production of any other good. An efficient point is one that lies **on** the production possibilities curve. At any such point, more of one good can be produced only by producing less of the other.

- b) Task solved in class.
- c) Task solved in class.
- d) Task solved in class.
- e) With economies of scale, the PPF would curve inward, with the opportunity cost of one good falling as more of it is produced. A straight-line (linear) PPF reflects a situation where resources are not specialized and can be substituted for each other with no added cost. With constant returns to scale, there are two opportunities for a linear PPF: if there was only one factor of production to consider or if the factor intensity ratios in the two sectors were constant at all points on the production-possibilities curve.
- f) Here is one example: Suppose a country that is endowed with two factors of production and that one factor can only be used for producing good A and the other factor can only be used to produce good B.

3.3.2 Indifference curves

Combinations of two goods that produce the same utility are plotted on an indifference curve. All points along an indifference curve produce the same utility for a country's consumers. Consumers are indifferent between points on the indifference curve. These curves are derived from utility functions that explain consumers' desire to consume different bundles of the two goods.

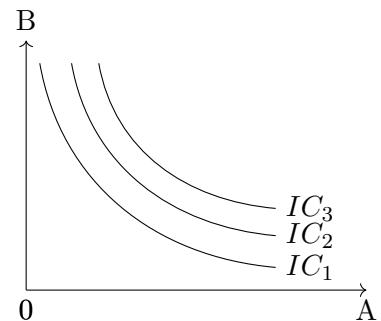


- The slope of an indifference curve indicates the rate at which two goods can be substituted without changing the consumers' utility. In technical terms, the marginal rate of substitution is equal to the absolute value of the slope of an indifference curve. It is the maximum quantity of a good that a consumer is willing to give up in order to obtain one additional unit of another good.
- We assume that each consumer seeks the highest possible indifference curve, because the higher, or farther to the right, an indifference curve lies in a coordination system, the higher the utility level it represents.

Exercise 3.2 — Understanding indifference curves

(Solution → p. 43)

- Which indifference curve in the figure on the right represents the highest utility level? Explain your decision.
- Suppose two goods are perfect substitutes^a. Draw the indifference curves for perfect substitutes.
- Suppose two goods are perfect complements^b. Draw the indifference curves for perfect complements.
- Suppose you have a fixed income $I = 10$ that you can spend on consuming two goods x, y at certain prices $p_x = 1, p_y = 1$. Draw the budget line consisting of all possible combinations of two goods that a consumer can buy at certain market prices by allocating his income. Using indifference curves, sketch what each consumer should consume to maximize utility.



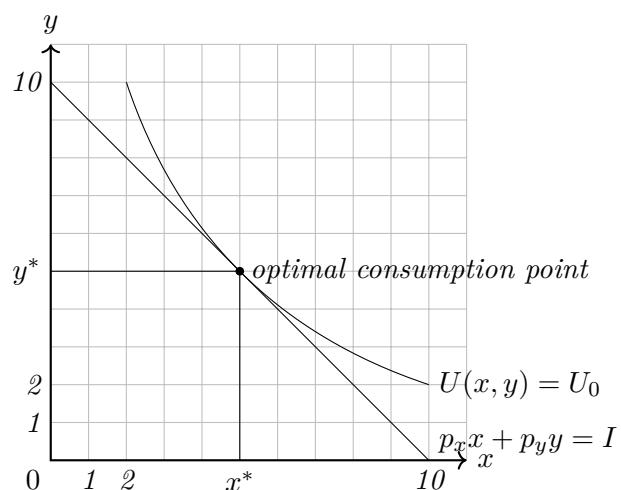
^aTwo goods are substitutes if they can be used for the same purpose or provide the same utility to the consumer

^bTwo goods are complements if they go well together and the demand for one good is related to the demand for another good. A perfect complement is a good that must be consumed together with another good

Solution to Exercise 3.2 — Understanding indifference curves (Exercise → p. 43)

- IC_3 represents the highest level of utility. IC_1 represents the lowest level of utility.
- Task solved in class.
- Task solved in class.
- The budget line can be sketched into a y - x plot by solving $p_x x + p_y y = I$ for y :

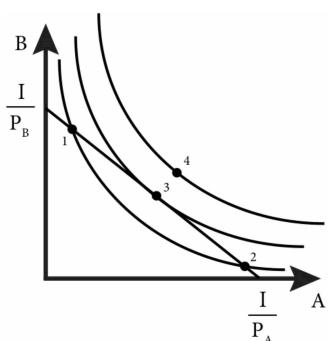
$$y = \frac{I}{p_y} - \frac{p_x}{p_y} x$$



3.3.3 Utility maximization

Exercise 3.3 — Utility maximization

(Solution → p. 44)



The figure on the right is from Emerson (2019, ch. 4). Match the following sentences to the respective points in the figure.

- Optimal bundle.
- Can do better by trading some B for some A.
- Can do better by trading some A for some B.
- Unaffordable.

Solution to Exercise 3.3 — Utility maximization

(Exercise → p. 43)

See *Emerson (2019, p. 46)*.

Utility maximization is a matter of selecting a combination of two goods that satisfies two conditions:

1. The point at which utility is maximized must be within the attainable region defined by PPF or affordable when there is a budget to spend.
2. The point at which utility is maximized must be on the highest indifference curve consistent with condition.

3.3.4 Important insights

I emphasize important insights, principles, and the alike in *Eurekas*¹:

Eureka 3.1 — Price in autarky

The price relation in autarky is equal to the slope of the PPF at the point where it is tangent to the indifference curve.

Eureka 3.2 — Utility maximizing production

The production point that maximizes utility is the point where the PPF is tangent to the price relation. This is true in autarky and under free trade.

Eureka 3.3 — Consumption under free trade

Starting from the production point, a country will trade goods until the world price relation is tangent to the indifference curve.

Exercise 3.4 — Sketch important insights

(Solution → p. ??)

Review the three key findings by sketching an explanatory graphic for each finding.

3.4 Exchange economy

3.4.1 A simple barter model

The simplest example to show that trade can be beneficial to people is the barter model. In trade, barter is a system of exchange in which participants in a transaction directly exchange goods or services for other goods or services without using a medium of exchange, such as money.

¹The word *Eureka* is a famous exclamation attributed to the philosopher Archimedes of Syracuse (287-212 B.C.) that denotes a sudden or unexpected realization of a problem solution



Source: Wikipedia

Stylized example of weißwurst and pretzels

Suppose there are two people, Anton (A) and Barbara (B). Anton has 10 Weißwürste (white sausages) and Barbara has 10 pretzels. Together, they are isolated from the rest of the world for a few days due to a natural disaster. Fortunately, they both have additional access to an endless supply of sweet mustard and beer and they now wonder how to share pretzels and sausages the upcoming days. Let's assume that both of them accept only a white sausage eaten together with a pretzel. That is, eating two pretzels with a sausage is no better than eating a pretzel and a sausage. After some discussion, Barbara gives 5 pretzels and Anton gives Barbara 5 sausages in return. They strongly believe that there is no better way to share food.

This example shows that trade can be beneficial for two individuals. Here we basically assume two things. Firstly, two individuals can trade and secondly, they are endowed with different goods.

Exercise 3.5 — How Barbara and Anton trade

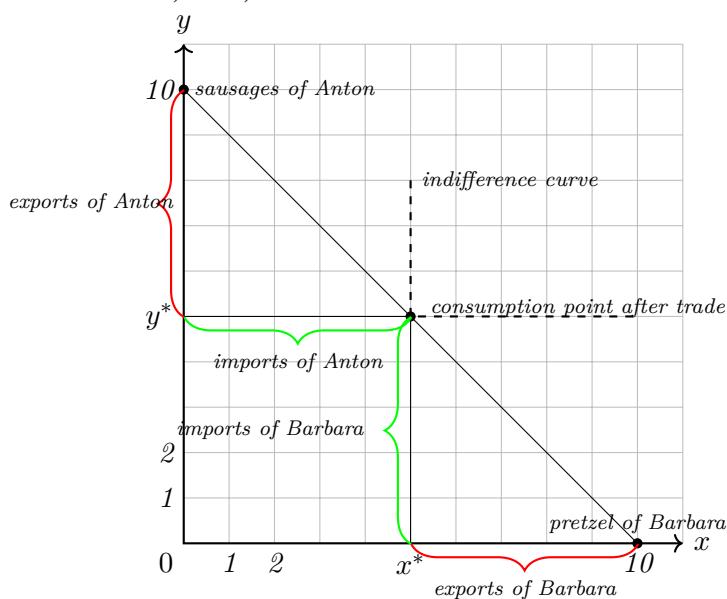
(Solution → p. 45)

- Visualize the starting point of Anton and Barbara as described above in a two-way plot where the Anton's initial endowment with sausages is drawn on the y-axis and Barbara's endowment with pretzels is drawn on the x-axis.
- Given their preferences, mark the consumption point after goods were traded. Also, draw in the plot how much Anton and Barbara *exports* and *imports*, respectively.
- Sketch the indifference curve of both individuals in the consumption point after trade has happened.
- Draw a new two-way plot and assume that Barbara now gives away 2 pretzels in order to receive one sausage. Mark the resulting consumption points of Anton and Barbara. Given their unchanged preference for having one sausage with one slice of bread at best, visualize with the help of sketched indifference curves that both individuals are worse off as compared to consuming 5 units of pretzels and sausages each.

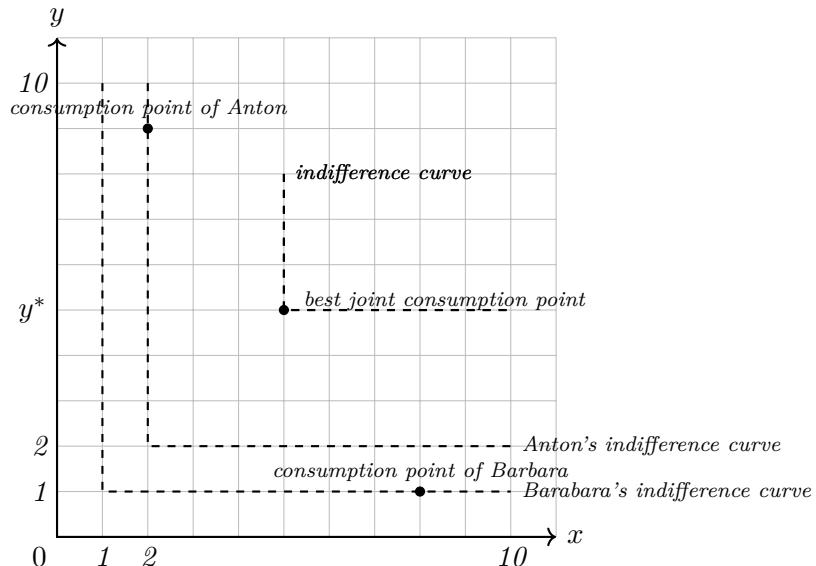
Solution to Exercise 3.5 — How Barbara and Anton trade

(Exercise → p. 45)

Here is a sketch of a solution: a) to c)



d)



3.4.2 Terms of trade

The terms of trade is defined as the quantity of one good that exchanges for a quantity of another. In this case, how many apples can be exchanged for how many oranges? It is typical to express the terms of trade as a ratio.

In the above example, the exchange of goods takes place at a ratio of 1:1. In economics, one speaks that the terms of trade are 1. The terms of trade is a ratio defined as the relative price of exports in relation to imports. In other words, the quantity of one good that can be exchanged for a quantity of another good. For example, how many sausages can be exchanged for how many pretzels. The terms of trade, which are ultimately determined by the two trading partners, depend on a variety of different and distinct factors, including the following:

Preferences For a trade to occur, each trader must desire something of the other good and be willing to give up something of his own good in order to obtain it. Put formally, the expected utility of eating a few slices of Anton's bread must be greater than the expected disutility of not eating a few of his sausages. The same logic applies to Barbara. In this case, extreme preferences were assumed. Normally, the two goods are not perfectly complementary, but substitutable.

Uncertainty In this situation, both people have clearly defined preferences. Perhaps Barbara has never tried one of Anton's sausages, and Anton usually eats bread and not pretzels. A simple way to eliminate this uncertainty would be to offer free samples of their products before an exchange is agreed upon. Without a sample, Anton and Barbara would have to make their exchanges based on their expectations of the taste of the other product.

Scarcity The relative quantities of the two goods available for trade affect the terms of trade. Suppose consider pretzels and sausages not to be perfect complements and suppose Barbara has 1000 pretzels then the terms of trade would likely be different.

Size The size of the goods is likely to affect the terms of trade.

Quality The quality of the goods will affect the terms of trade. Assuming the pretzels are old and hard, both individuals would likely prefer less than one pretzel per sausage.

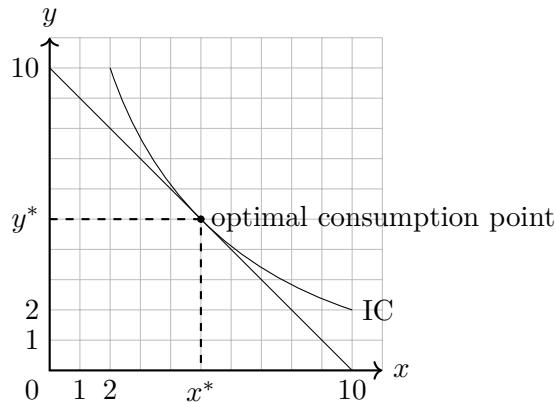
Persuasion If Barbara is a good salesperson and Anton is not, she may have the power to influence the terms of trade to her advantage.

Government Policy Suppose a tax official is willing to impose a tax based on the quantities traded

between Barbara and Anton, this is likely to influence the terms of trade. If the laws prohibit the two from meeting in person, they will not trade either.

Exercise 3.6 — Terms of trade

(Solution → p. 47)

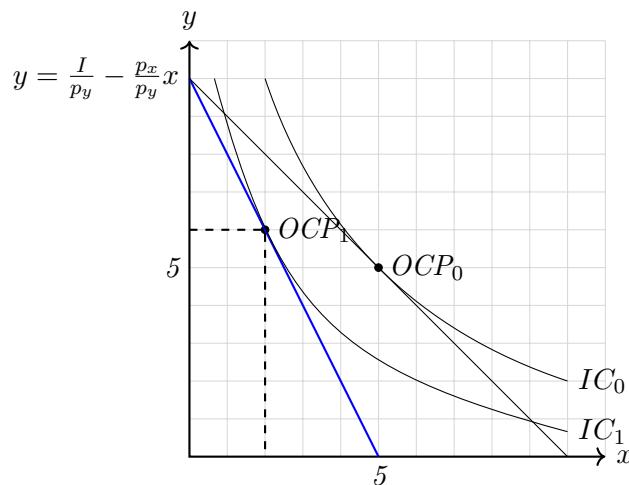


Suppose you have a fixed income $I = 10$ that you can spend on consuming two substitutable goods x, y at certain prices $p_x = 1, p_y = 1$. The current consumption decision is sketched in the figure above. Suppose the price of good x increases, i.e., $p_x = 2$. Draw the new budget line. How will consumption change? What are the new terms of trade?

Solution to Exercise 3.6 — Terms of trade

(Exercise → p. 47)

The new point of optimal consumption OCP_1 at $(x = 2, y = 6)$ illustrates that an increase in the price of good x leads consumers to substitute good x and consume more of good y but less of good x .^a The terms of trade are now $\frac{p_x}{p_y} = 2$. That is, consumers are willing to give up 1 unit of good x to receive 2 units of good y . The budget line is drawn in blue.



^aPlease notice that the indifference curve IC_1 in the graph is just a guess of mine because we don't have preferences in form of a utility function given. For example, you can also draw an indifference curve that gives you the optimal consumption point at $(x = 1; y = 8)$ or $(x = 4; y = 2)$.

3.4.3 Endowments in an exchange economy

Trade is a decision to give up something in order to receive something in return. If this decision is made of free will, it must improve the situation of both participants in the trade (but not necessarily that of all those who are not involved in the trade in question).

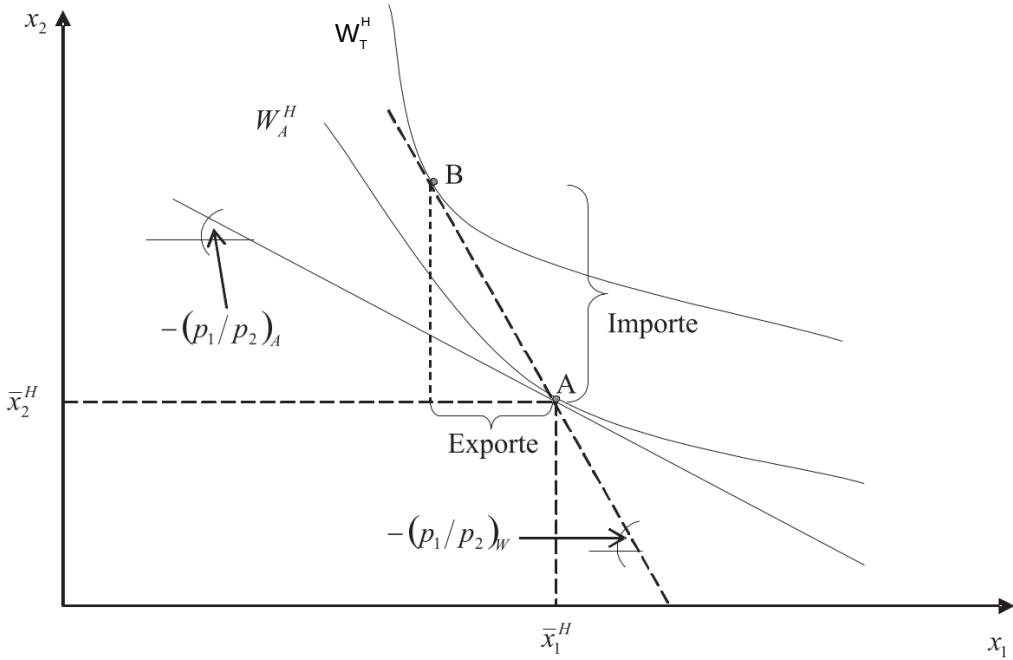


Figure 3.3: Optimizing consumption through trade

Fixed production

- Suppose country H produces \bar{x}_1^H of good 1 and \bar{x}_2^H of good 2. In autarky, all goods produced are consumed. The autarkic consumption is represented in Figure 3.3. We see that point A in autarky is indeed welfare maximizing with utility W_A^H .
- Now suppose country H can trade with other countries at world prices

$$\left(\frac{p_1}{p_2}\right)_W > \left(\frac{p_1}{p_2}\right)_A,$$

where $\left(\frac{p_1}{p_2}\right)_A$ denotes the price relation of country H in autarky.

- Then country H can use a consumption basket with a higher utility, $W_T^H > W_A^H$.
- This utility improvement is possible by exporting good x_1 and importing good x_2 .

Flexible production

- Trade is even more beneficial to a country if it can adjust its production to export more goods that are relatively high priced in the world market. This statement is shown in Figure 3.4.
- In autarky, optimal consumption would be at point A and optimal production would be at point C under free trade. Now suppose that producers in country H know that they can sell their goods at price p_1^W and p_2^W before deciding what to produce. Then they would choose production point B on the production frontier curve to export good x_1 and import good x_2 at price $\left(\frac{p_1}{p_2}\right)_A$ to be consumed at point D. Welfare at point D is higher than at point C or A because we end up at the highest indifference curve.

Exercise 3.7 — Production and consumption

(Solution → p. ??)

The figure below shows the production possibility frontier curve, PPF , of a country, H , in autarky in which only two products, x_1 and x_2 , can be produced and consumed, respectively.

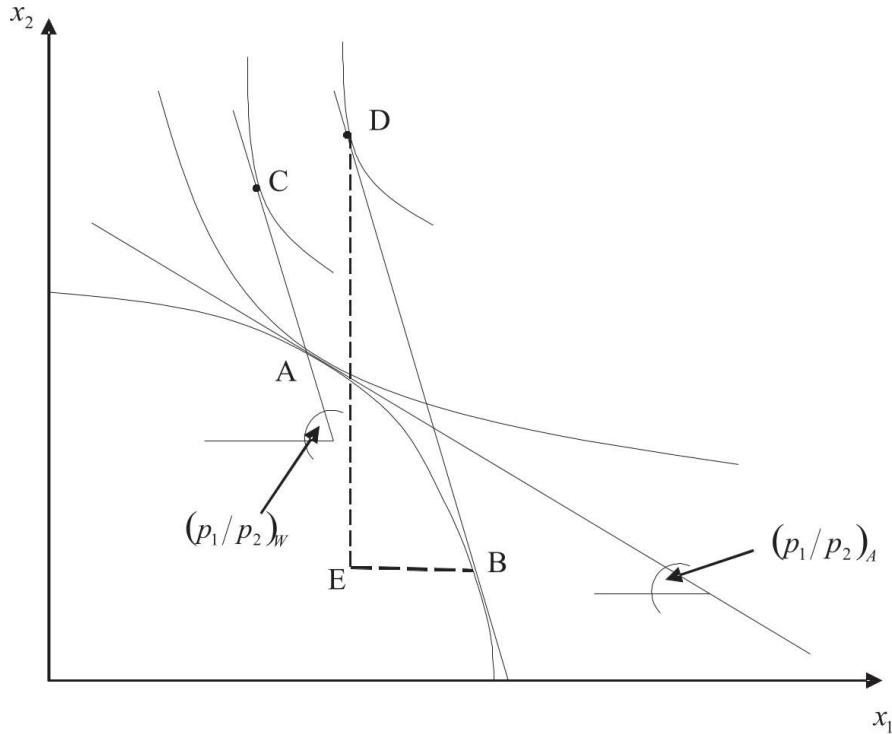
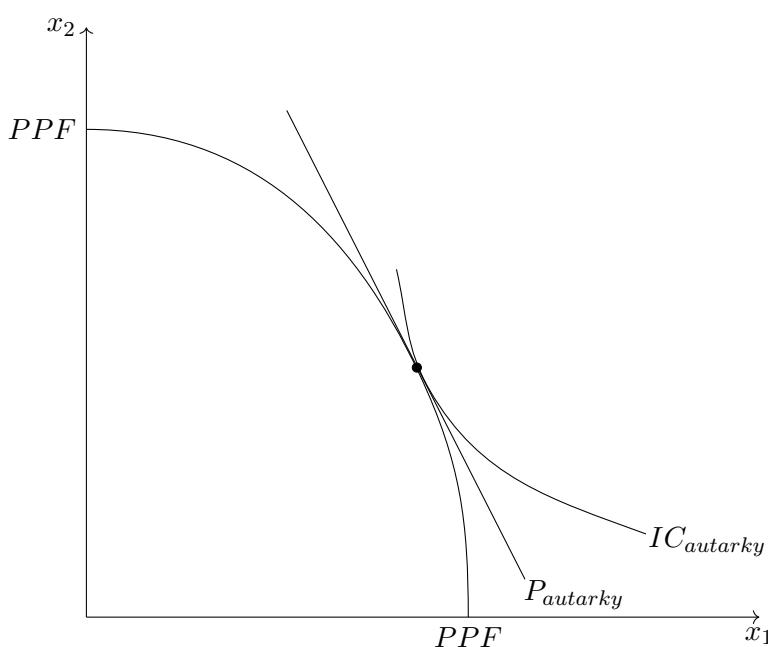


Figure 3.4: Optimizing consumption by adjusting production and trade



- Given the country is in autarky (i.e., no trade), the price relation of both goods within the country is represented by the line denoted with $P_{autarky}$. The indifference curve that represents the utility maximizing level of utility is denoted with $IC_{autarky}$. Mark in the figure how much of both goods are produced and consumed, respectively.
- Suppose country H opens up to trade with foreign countries. Further assume that the country can trade with other countries at fixed world market prices

$$\left(\frac{p_1}{p_2}\right)_W > \left(\frac{p_1}{p_2}\right)_A,$$

where $\left(\frac{p_1}{p_2}\right)_A$ denotes the price relation of country H in autarky, $P_{autarky}$. Sketch the world

market price relation in the figure and mark the new production point on the production possibility frontier curve. Moreover, mark below those statements that are **true**:

- i) Country H will produce more of good x_1 than in autarky
- ii) Country H will produce more of good x_2 than in autarky
- iii) Country H will consume more of good x_1 than in autarky
- iv) Country H will export good x_1 and import good x_2 .
- v) Country H will export good x_2 and import good x_1 .
- vi) Country H will suffer a loss of welfare due to opening up to trade.

Exercise 3.8 — Gains of small economies

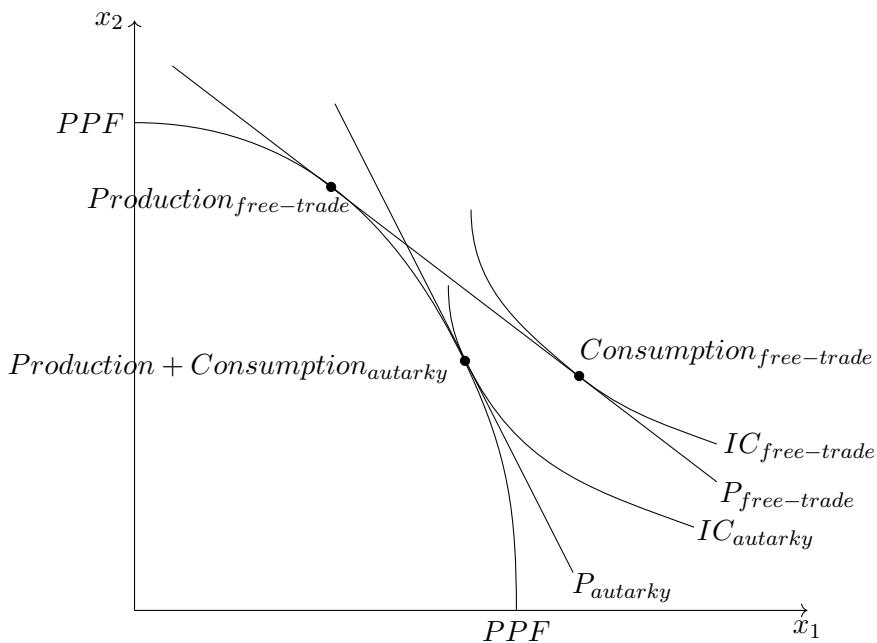
(Solution → p. 50)

Show that opening markets to foreign trade can be beneficial for a small economy where only two goods can be produced and consumed. Use a two-way diagram to do this. In particular, show the consumption and production point of the economy in autarky with the corresponding price relation. Then assume that the economy opens up to the foreign market, allowing it to buy goods at world prices that are different from prices in autarky. Show the consumption and production point of the autarkic economy with the corresponding price relation under free trade. Can you outline the higher level of welfare in free trade?

Solution to Exercise 3.8 — Gains of small economies

(Exercise → p. 50)

The indifference curve under free trade lies above the IC under autarky. This reflects the higher utility level under free trade.



3.5 More trade is not necessarily good (immiserizing growth)

- So far, I have implicitly assumed that the world market price is fixed and not changed by the entry of country H into the free trade market. When the latter is the case, economists speak of a small open economy (SOE). In general, a SOE is an economy that is so small that its policies do not change world prices.
- Suppose that country H is not an SOE. What would happen to world prices if country H offered a lot of good x_1 to receive good x_2 ? Obviously, $\left(\frac{p_1}{p_2}\right)_W$ would fall. In the worst case, country H is so large that $\left(\frac{p_1}{p_2}\right)_W = \left(\frac{p_1}{p_2}\right)_A$. This means that country H has no benefits from free trade.

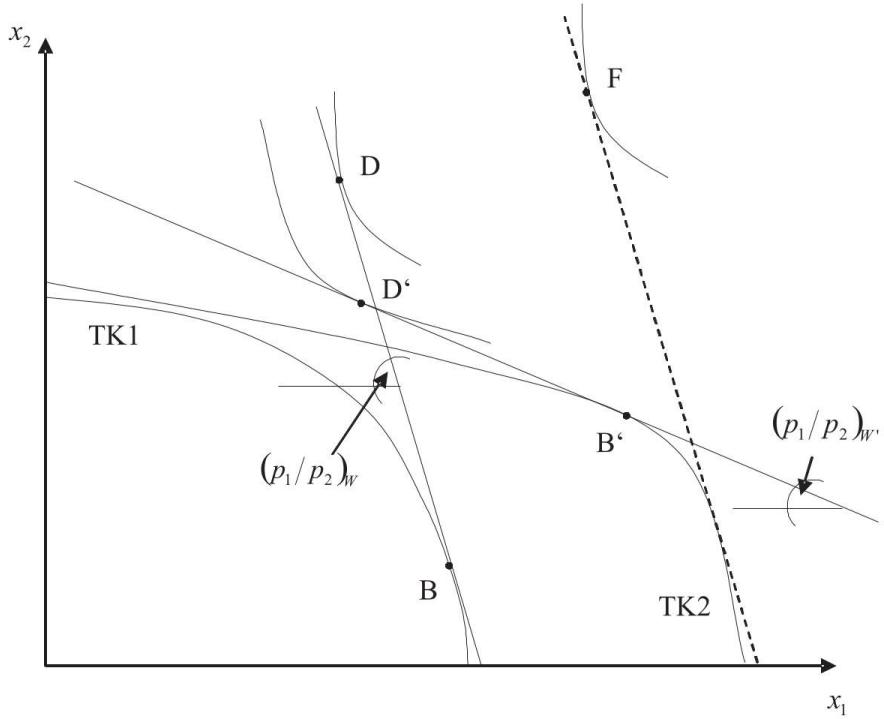


Figure 3.5: Immiserizing growth

- Assuming that a (large) country cannot opt out from free trade and that the exporting sector grows, there is a theoretical scenario called *immiserizing growth* that shows that free trade countries are worse off in the long run. This scenario is illustrated in Figure 3.5. The figure summarizes two periods. In the first period, country H produces at point B and consumes at point D, trading goods at world prices $(\frac{p_1}{p_2})_W$. Then country H grows in sector 1. This is shown in the new production possibility curve TK2. If country H were able to trade at the old world price, it would be able to consume at point F. Unfortunately, country H is not a SOE, and therefore world prices (from country H's perspective) deteriorate to $(\frac{p_1}{p_2})'_W$. This has bad implications for country H, since its optimal consumption is now at point D', which has lower welfare relative to point D. However, this is not an argument against trade, since the welfare at point D' is still above the production possibility curve in autarky, TK1.

3.6 The theory of comparative advantage (Ricardian Model)

Learning goals

- Less-developed countries can compete in international markets even if they are less productive in producing everything. In other words, opening to trade is beneficial for countries that have an absolute disadvantage in the production of all goods.
- Both, developed and less-developed countries can gain from international trade.
- Specialization in production increases the price of exported goods for that country. As a result, prices converge.
- A discussion of national competitiveness is not useful through the lens of the Ricardo theorem.

Recommended reading

- Chapter 2 of Suranovic, S. (2012). *International Economics: Theory and Policy*. Saylor Foundation, 1.0 edition. https://saylordotorg.github.io/text_international-economics-theory-and-policy/index.html [Online; accessed 20-November-2022]



This painting shows Ricardo, aged 49 in 1821.
Source: National Portrait Gallery

David Ricardo (1772-1823), one of the most influential economists of his time, had a simple idea that had a major impact on how we think about trade. In [Ricardo \(1817\)](#), he argued that bilateral trade can be a positive-sum game for both countries, even if one country is less productive in all sectors, if each country specializes in what it can produce relatively best.

He introduced the theory of comparative advantage that is still an important corner stone of the modern theory of international trade^a. It refers to the ability of one party (an individual, a firm, or a country) to produce a particular good or service at a lower opportunity cost than another party. In other words, it is the ability to produce a product with the highest relative efficiency, given all other products that could be produced. In contrast, an absolute advantage is defined as the ability of one party to produce a particular good at a lower absolute cost than another party.

^aActually, strictly speaking, this is not correct, since the original description of the idea can already be found in 1815 in the *Essay on the External Corn Trade* by Robert Torrens. However, David Ricardo formalized the idea in his 1817 book using a convincing and simple numerical example. For more information on this, as well as a great introduction to the Ricardian model and more, I recommend [Suranovic \(2012\)](#).

3.6.1 Defining absolute and comparative advantages

A subject (country, household, individual, company) has an **absolute advantage** in the production of a good relative to another subject if it can produce the good at lower total costs or with higher productivity. Thus, absolute advantage compares productivity across subjects but within an item.

A subject has a **comparative advantage** in the production of a good relative to another subject if it can produce that good at a lower opportunity cost relative to another subject.

Let me explain the idea of the concept of comparative advantage with some examples:

Old and young Two women live alone on a deserted island. In order to survive, they have to do some basic activities like fetching water, fishing and cooking. The first woman is young, strong and educated. The second is older, less agile and rather uneducated. Thus, the first woman is faster, better and more productive in all productive activities. So she has an absolute advantage in all areas. The second woman, in turn, has an absolute disadvantage in all areas. In some activities, the difference between the two is large; in others, it is small. The law of comparative advantage states that it is not in the interest of either of them to work in isolation: They can both benefit from specialization and exchange. If the two women divide the work, the younger woman should specialize in tasks where she is most productive (e.g., fishing), while the older woman should focus on tasks where her productivity is only slightly lower (e.g., cooking). Such an arrangement will increase overall production and benefit both.

The lawyer's typist The famous economist and Nobel laureate Paul Samuelson (1915-2009) provided another example in his well-received textbook of economics, as follows: Suppose that in a given city the best lawyer also happens to be the best secretary. However, if the lawyer focuses on the task of being a lawyer, and instead of practicing both professions at the same time, hires a secretary, both the lawyer's and the secretary's performance would increase because it is more difficult to be a lawyer than a secretary.²

3.6.2 Autarky: An example of two different persons

Assume that A and B want to produce and consume y and x respectively. Because of the complementarity of the two goods, each must be consumed in combination with the other. The utility function of both persons is $U_{\{A;B\}} = \min(x, y)$. Both persons work for 4 time units, i.e., their *units of labor* are $L_A = L_B = 4$. A needs 1 unit of labor to produce one unit of good y and 2 units of labor to produce one unit of good x . B needs $\frac{4}{10} = 0.4$ units of labor to produce one unit of good y or good x . Thus, their **labor input coefficients**, which measure the units of labor required by a subject to produce one unit of good, are $a_y^A = 1, a_x^A = 2, a_y^B = 0.4, a_x^B = 0.4$:

		Person	
input coefficient (a)		A	B
Good y		1	0.4
Good x		2	0.4

Spending all her time in the production of y , A can produce $\frac{L_A}{a_y^A} = \frac{4}{1} = 4$ units of y and B can produce $\frac{L_B}{a_y^B} = \frac{4}{0.4} = 10$ units of y . Spending all her time in the production of y , A can produce $\frac{L_A}{a_x^A} = \frac{4}{2} = 2$ units of x and B can produce $\frac{L_B}{a_x^B} = \frac{4}{0.4} = 10$ units of x . Knowing this, we can easily draw the production possibility frontier curves (PPF) of person A and B as shown in Figure 3.6.

²In the first eight editions the example comprised a male lawyer who was better at typing than his female secretary, but who had a comparative advantage in practising law. In the ninth edition published 1973, both lawyer and secretary were assumed to be female (see [Backhouse and Cherrier, 2019](#)) Unfortunately, women are still discriminated against in introductory economics textbooks (see [Stevenson and Zlotnik, 2018](#)).

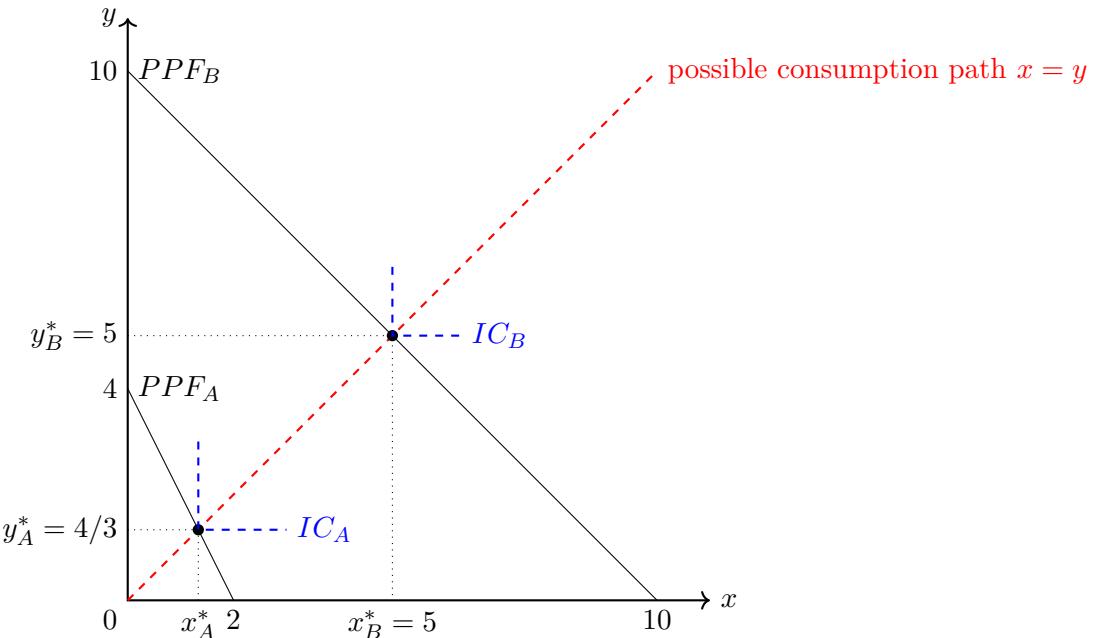


Figure 3.6: The production possibility frontier in autarky

In autarky, both person maximize their utility: Individual A can consume $\frac{4}{3}$ units of each good and individual B can consume 5 units of each good. The respective indifference curves are drawn in dashed blue lines in Figure 3.6.

Exercise 3.9 — Indifference curves for perfect complementary goods (Solution → p. ??)

- Name some real world examples of goods that are perfectly complementary.
- The blue dashed lines in Figure 3.6 represent the indifference curves of individual A and B. The upward sloping dashed black line is denoted with “possible consumption path”. Explain, why is it not correct—in strict sense—to name it like that?

Can person A and B improve their maximum consumption with cooperation?

Let us assume the two persons come together and try to understand how they can improve by jointly deciding which goods they should produce. If we assume that both persons redistribute their joint production so that both have an incentive to share and trade, we can concentrate on the total production output. Their joint PPF curve can then be drawn in two ways:

- Person A specializes in good x , then the joint production possibilities are presented in Figure 3.7.
- Person A specializes in good y , then the joint production possibilities are presented in Figure 3.8.

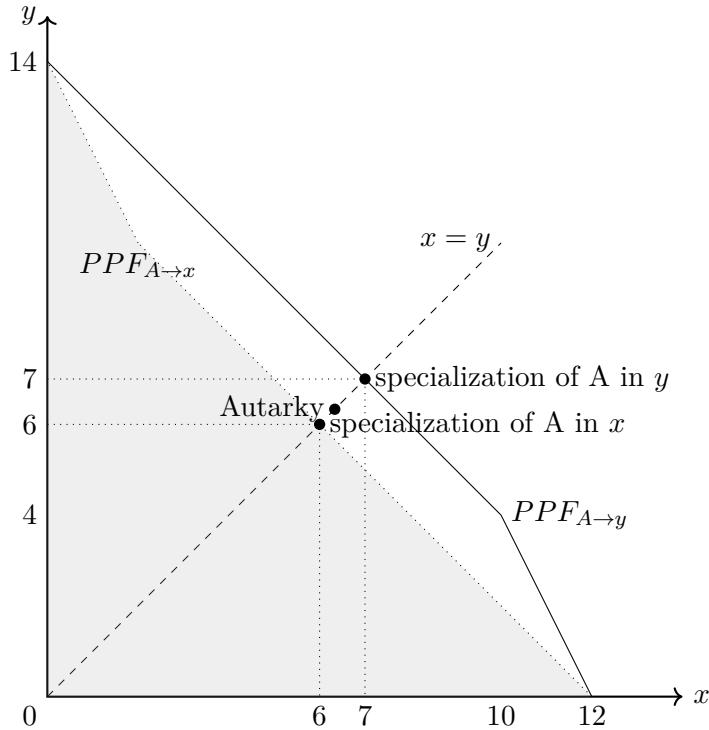


Figure 3.9: World PFF in autarky when A specializes in producing good y

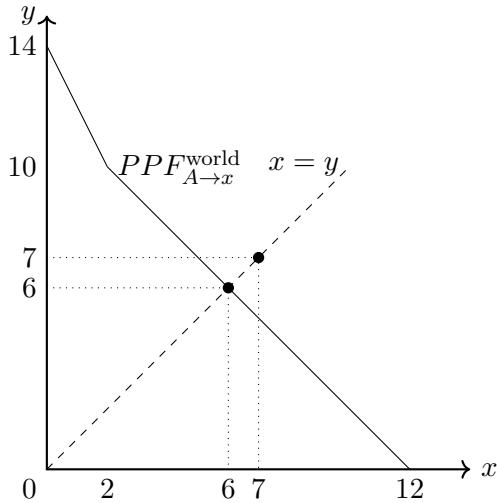


Figure 3.7: World PFF, A specializes in x

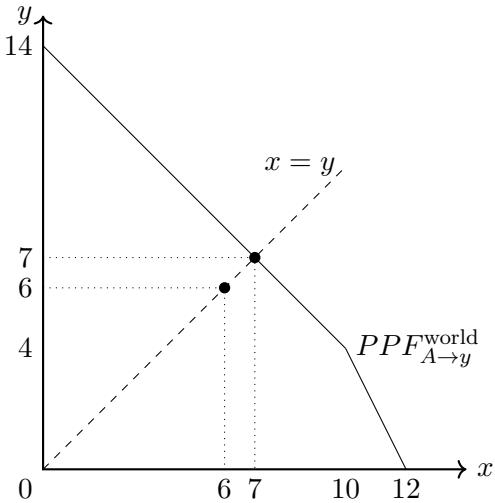


Figure 3.8: World PFF, A specializes y

If A produces only good x , as shown in Figure 3.7, we see that A and B can consume a total of 6 units of goods x and y . This is less in total than in autarky, where A can consume $\frac{4}{3}$ units of each good and person B can consume 5 units of each good, giving a combined consumption of $\frac{19}{3} = 6, \bar{6}$.

If A produces only good y , as shown in Figure 3.8, we see that A and B can consume a total of 7 units of goods x and y . Thus, both can be better off compared to autarky, since the total quantity distributed is larger. Thus, we have a **Pareto improvement** here because at least one person can be better off compared to autarky.

In Figure 3.9, the three possible consumption scenarios are marked with a dot and the PPFs of person A specializing in the production of good x ($PPF_{A \rightarrow x}$) or good y ($PPF_{A \rightarrow y}$) are also drawn. The scenario with person A specializing in the production of good y is the output maximizing solution.³

³Note that this is also true for any other utility function, since $PPF_{A \rightarrow y}$ is always above $PPF_{A \rightarrow x}$.

Optimal production in cooperation

In order to produce the most bundles of both goods, the optimal cooperative production is

production in cooperation	Person	
	A	B
Good y	4	3
Good x	0	7

Check for absolute advantage

Employing 10 units of labor B can produce more of both goods and hence has an absolute advantage in producing x and y . Formally, we can proof this by comparing the input coefficients of both countries in each good:

absolute advantage	Person	
	A	B
Good y	$a_y^A = 1 > 0.4 = a_y^B$	\Rightarrow B has an absolute advantage in good y
Good x	$a_x^A = 2 > 0.4 = a_x^B$	\Rightarrow B has an absolute advantage in good x

Check for comparative advantage

The slope of the PPFs represent the *marginal rate of transformation*, the terms of trade in autarky and the opportunity costs of a country. The opportunity costs are defined by how much of a good x (or y) a person (or country) has to give up to get one more of good y (or x). For example, A must give up $\frac{a_x^A}{a_y^A} = \frac{1}{2} = 0.5$ of good x to produce one more of good y . Thus, A's opportunity costs of producing one unit of y is the production foregone, i.e., a half good x . All opportunity costs of our example are:

opportunity costs of producing ...	Person	
	A	B
... 1 unit of good y :	$\frac{a_y^A}{a_x^A} = \frac{1}{2} = 0.5$ (good x)	$\frac{a_y^B}{a_x^B} = \frac{0.4}{0.4} = 1$ (good x)
... 1 unit of good x :	$\frac{a_x^A}{a_y^A} = \frac{2}{1} = 2$ (good y)	$\frac{a_x^B}{a_y^B} = \frac{0.4}{0.4} = 1$ (good y)

Person A has a comparative advantage in producing good y since A must give up less of good x to produce one unit more of good y than person B must. In turn, Person B has a comparative advantage in producing good x since B must give up less of good y to produce one unit more of good x than person B must give up of good y to produce one unit more of good x . Thus, every person has a comparative advantage and if both would specialize in producing the good in which they have a comparative advantage and share their output they can improve their overall output as was shown in [Figure 3.9](#).

An alternative and more direct way to see the comparative advantages of A and B, respectively, is by comparing the two input coefficients of A with the two input coefficients of B:

$$\frac{a_y^A}{a_x^A} \leq \frac{a_y^B}{a_x^B} \quad \Rightarrow \quad \frac{1}{2} < \frac{0.4}{0.4}.$$

Thus, A has a comparative advantage in y and B in x .

Eureka 3.4 — Comparative advantage: Definition

Economic subjects (e.g., individuals, households, firms, countries) should specialize in the production of that good in which they have a comparative advantage, that is, the ability of an economic subject to carry out a particular economic activity (e.g., producing goods) at a lower opportunity cost than a trade partner.

- $\frac{a_y^A}{a_x^A} > \frac{a_y^B}{a_x^B} \Rightarrow$ country A (B) has a comparative advantage in good x (y)
- $\frac{a_y^A}{a_x^A} < \frac{a_y^B}{a_x^B} \Rightarrow$ country A (B) has a comparative advantage in good y (x)
- $\frac{a_y^A}{a_x^A} = \frac{a_y^B}{a_x^B} \Rightarrow$ no country has a comparative advantage

Trade structure and consumption in cooperation

If A specializes in the production of y , she must import some of good y , otherwise she cannot consume a bundle of both goods as desired. In turn, B wants to import some of the good y . B will not accept to consume less than 5 bundles of y and x as this was his autarky consumption. Thus, B wants a minimum of 2 units of good y from A. A will not accept to give more than $4 - \frac{4}{3} = 2\frac{2}{3}$ items of good y away and he wants at least $\frac{4}{3}$ items of good x . Overall, we can define three trade scenarios:

1. All gains from cooperation goes to A (see [Figure 3.10](#)):

		Person	
consumption in cooperation		A	B
Good y		2	5
Good x		2	5

		Person	
inflow/outflow of goods in cooperation		A	B
Good y		-2	2
Good x		2	-2

2. All gains from cooperation goes to B:

		Person	
consumption in cooperation		A	B
Good y		$\frac{4}{3}$	$5\frac{2}{3}$
Good x		$\frac{4}{3}$	$5\frac{2}{3}$

		Person	
inflow/outflow of goods in cooperation		A	B
Good y		$-\frac{2}{3}$	$\frac{2}{3}$
Good x		$\frac{4}{3}$	$-\frac{4}{3}$

3. The gains from specialization and trade are shared by A and B: Some trade structure between the two shown above.

Each of the three cases yield a pareto-improvement, i.e., none gets worst but at least one gets better by mutually decide on production and redistribute the joint output. In the real world, however, it is often difficult for countries to cooperate and decide mutually on production and consumption. In particular, it is practically difficult to enforce redistribution of the joint outcome so that everyone is better off. So let's examine whether there is a mechanism that yields trade gains for both trading partners.

3.6.3 The Ricardian model

To understand the underlying logic of the argument, let us formalize and generalize the situation of two subjects and their choices for production and consumption. In particular, the Ricardian Model build on the following assumptions:

- 2 subjects (A,B) can produce 2 goods (x,y) with
- technologies with constant returns to scale. Moreover,
- production limits are defined by

$$a_y^i Q_y^i + a_x^i Q_x^i = L^i,$$

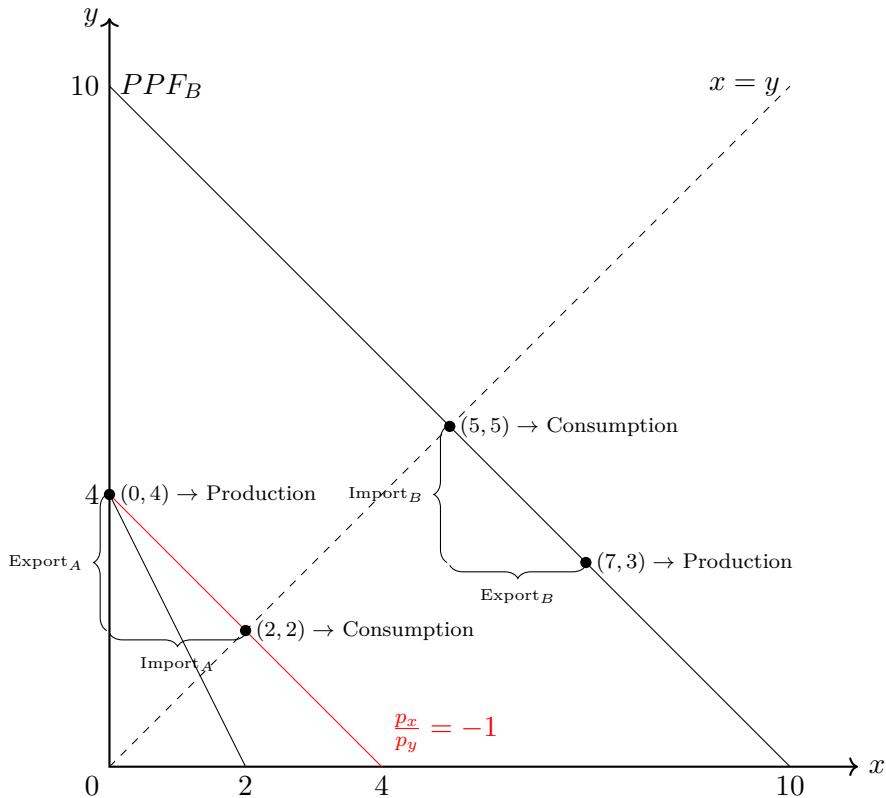


Figure 3.10: Bilateral trade with one winner

where a_j^i denotes the unit of labor requirement for person $i \in \{A, B\}$ in the production of good $j \in \{x, y\}$ and Q_j^i denotes the quantity of good j produced by person i , and Q_j^i the quantity of good j produced by person i and Q_j^i the quantity of good j produced by person i . (Imagine they both work 4 hours).

- Let a_j^i denote the so-called labor input coefficients, i.e., the units of labor required by a person $i \in \{A, B\}$ to produce one unit of good $j \in \{x, y\}$.
- Suppose further that person B requires fewer units of labor to produce both goods, i.e., $a_y^A > a_y^B$ and $a_x^A > a_x^B$, and that
- a comparative advantage exists, i.e., $\frac{a_y^B}{a_x^B} \neq \frac{a_y^A}{a_x^A}$.

Eureka 3.5 — Ricardian theorem

If each country specialize in the production in the good for which it has a comparative advantage and exports this good, both countries gain from trade when the new world market price relation, $\frac{p_y^*}{p_x^*}$, lies between the price relations of both countries^a

$$\frac{a_y^B}{a_x^B} = \frac{p_y^B}{p_x^B} > \frac{a_y^*}{a_x^*} = \frac{p_y^*}{p_x^*} > \frac{p_y^A}{p_x^A} = \frac{a_y^A}{a_x^A}$$

because the consumption possibilities enlarge for both countries compared to a situation with no trade.

^aIn order to see that the relative prices within a country equals the relative productivity parameters, consider that nominal income of labor in producing good $j \in \{x, y\}$, $w_j L_j^i$, must equal the production value, that is, $p_j^i x_j^i$:

$$w_j L_j^i = p_j^i x_j^i.$$

Setting $w_j = 1$ as the numeraire and re-arranging the equation, we get

$$p_j^i = \frac{L_j^i}{x_j^i} = a_j^i.$$

3.6.4 Distribution of welfare gains

The Ricardo theorem tells us nothing about the precise distribution of welfare gains. In this section, I will show that the distribution of welfare gains is the result of relative supply and demand in the world.

To illustrate this, consider Ricardo's famous example⁴ of two countries (England and Portugal) that can produce cloth T and wine W with different input requirements, namely:

$$\frac{p_W^P}{p_T^P} = \frac{a_W^P}{a_T^P} = \frac{8}{9} < \frac{12}{10} = \frac{a_W^E}{a_T^E} = \frac{p_W^E}{p_T^E}$$

Thus, England has an absolute disadvantage in the production of both goods, but England has a *comparative advantage in the production of cloth* and Portugal has a *comparative advantage in the production of wine*. Let us further assume that both countries are similarly endowed with labor, \bar{L} . Then we can calculate the world supply of cloth and wine given relative world prices, $\frac{p_T}{p_W}$. Since we know that Portugal will only produce wine if the price of wine relative to cloth is above $\frac{p_W}{p_T} = \frac{8}{9}$ and England will only produce wine if the price of wine relative to cloth is above $\frac{p_W}{p_T} = \frac{12}{10}$, we can draw the relative world supply of goods as shown in the left panel of Figure 3.11. Note that α in the figure means $\frac{1}{\alpha}$. Similarly, we can draw in the world supply of clothes, shown in the right panel of Figure 3.11.

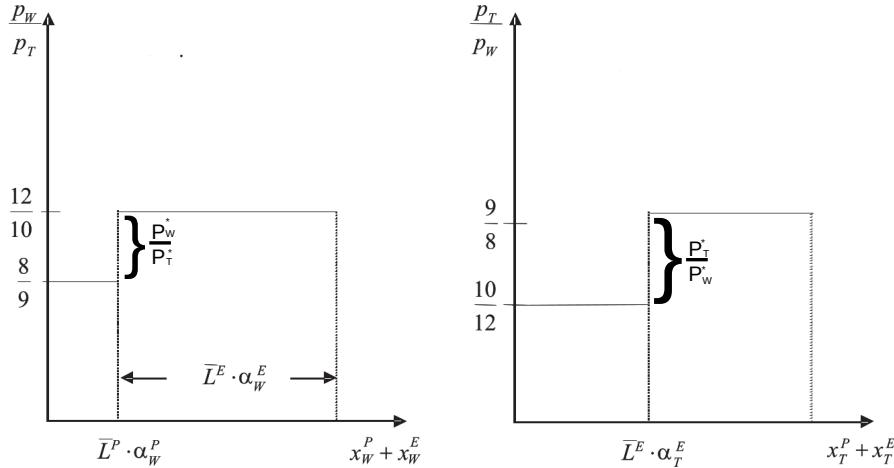


Figure 3.11: World's relative supply

Whether both countries specialize totally in the production of one good, or only one country does so depends on world demand for both goods at relative prices. Since we know from the Ricardo Theorem that the world market price relation, $\frac{p_T^*}{p_W^*}$, must be between the two autarky price relations:

$$\frac{p_T^P}{p_W^P} > \frac{p_T^*}{p_W^*} > \frac{p_T^E}{p_W^E}.$$

If world demand for cloth would be sufficiently high to have a world price of $\frac{p_T^P}{p_W^P} = \frac{9}{8}$ Portugal would not gain from trade. On the contrary, if world demand for wine would be sufficiently high to have a world price of $\frac{p_T^P}{p_W^P} = \frac{10}{12}$ England would not gain from trade. Thus, the price span between $\frac{10}{12}$ and $\frac{9}{8}$ says us

⁴The example is explained by Sutanovic (2012) in greater detail.

which country gains from trade. For example, at a world price of $\frac{p_T^*}{p_W^*} = 1$ about 57% $\left[\frac{(1 - \frac{10}{12})}{(\frac{9}{8} - \frac{10}{12})} \approx 0.57 \right]$ of the gains through trade will be distributed to Portugal and about 43% will be distributed to England.

In [Figure 3.12](#), I show two demand curves of the World. The dashed demand curve represents a world with a relative strong preference on wine and the other demand curve represents a relative strong demand for cloth. Since Portugal has a comparative advantage in producing wine, they would happy to live in a world where demand for wine is relatively high, whereas the opposite holds true for England.

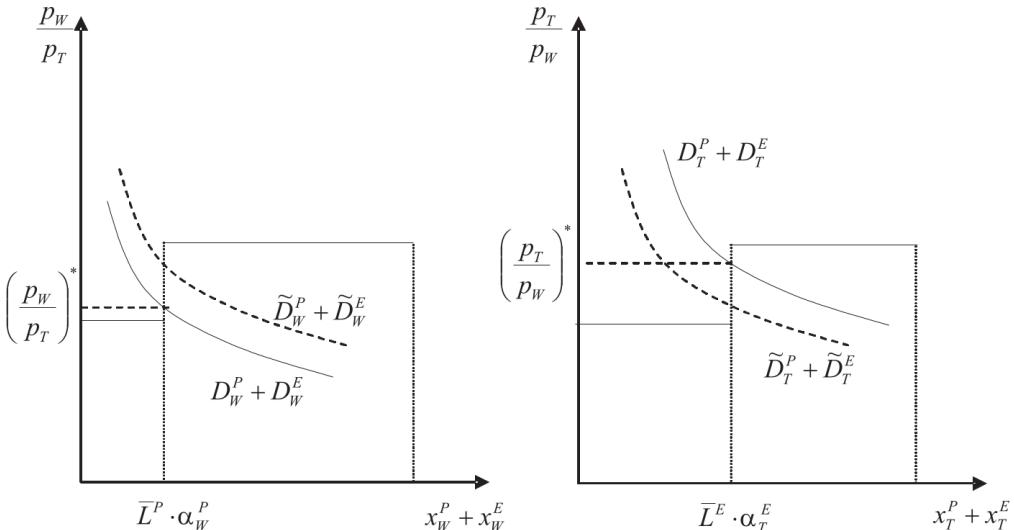


Figure 3.12: World's relative supply and demand

Exercise 3.10 — Comparative advantage and opportunity costs

(Solution → p. [61](#))

Assume that only two countries, A and B, exist. Both countries are equally endowed with labor which is the only production factor. Both countries can produce either good y or good x . The table below gives the input coefficients, a , for both countries, i.e., the units of labor needed to produce one unit of good y and good x , respectively. Assume that both countries have 12 units of labor available.

	Countries	
	A	B
Good y	1	3
Good x	2	4

- Name the country with an absolute advantage.
- Draw the production possibility curves in a y-x-diagramm.
- What are *opportunity costs*?
- Calculate how many goods of x country A has to give up to produce one unit more of good y .
- Calculate how many goods of y country A has to give up to produce one unit more of good x .
- Calculate how many goods of x country B has to give up to produce one unit more of good y .
- Calculate how many goods of y country B has to give up to produce one unit more of good x .
- Name the country with a comparative advantage in good y .
- Name the country with a comparative advantage in good x .

Solution to Exercise 3.10 — Comparative advantage and opportunity costs (Exercise → p. 60)

a) Country A has an absolute advantage in producing both goods as

$$a_y^A = 1 < 3 = a_y^B$$

and

$$a_x^A = 2 < 4 = a_x^B$$

b) Solution is shown in the lecture.

c) Opportunity cost is the value of what you lose when choosing between two or more options.
Alternative definition: Opportunity cost is the loss you take to make a gain, or the loss of one gain for another gain.

d) If A wants to produce one unit more of good y it has to give up $\frac{1}{2}$ units of good x.

e) If A wants to produce one unit more of good x it has to give up 2 units of good y.

f) If B wants to produce one unit more of good y it has to give up $\frac{3}{4}$ units of good x.

g) If A wants to produce one unit more of good x it has to give up $\frac{4}{3}$ units of good y.

	Person	
opportunity costs of producing ...	A	B
... 1 unit of good y	$\frac{a_y^A}{a_x^A} = \frac{1}{2} = 0.5$ (good x)	$\frac{a_y^B}{a_x^B} = \frac{3}{4} = 0.75$ (good x)
... 1 unit of good x	$\frac{a_x^A}{a_y^A} = \frac{2}{1} = 2$ (good y)	$\frac{a_x^B}{a_y^B} = \frac{4}{3} = 1.33$ (good y)

h) Country A has a comparative advantage in producing good y.

i) Country B has a comparative advantage in producing good x.

Exercise 3.11 — The best industry is not competitive

(Solution → p. 61)

Assume that only two countries, A and B, exist. Both countries are equally endowed with labor which is the only production factor. Both countries can produce either good y or good x. The table below gives the input coefficients, a , for both countries, i.e., the units of labor needed to produce one unit of good y and good x, respectively.

	Countries	
	A	B
Good y	10	9
Good x	12	10

Discuss absolute and comparative advantages. How much faster does B needs to in producing good y to become an exporter of that good?

Solution to Exercise 3.11 — The best industry is not competitive (Exercise → p. 61)

B has an absolute advantage in both goods. The opportunity costs are given by:

	Country	
opportunity costs of producing ...	A	B
... 1 unit of good: y	$\frac{a_x^A}{a_y^A} = \frac{10}{12} = 0.833\dots$ (good x)	$\frac{a_x^B}{a_y^B} = \frac{9}{10} = 0.9$ (good x)
... 1 unit of good: x	$\frac{a_y^A}{a_x^A} = \frac{12}{10} = 1.2$ (good y)	$\frac{a_y^B}{a_x^B} = \frac{10}{9} = 1.11\dots$ (good y)

Thus, A has a comparative advantage in producing good y and B has a comparative advantage

in producing good x . This seems to be counterintuitive as B can produce faster anything and everybody else.

When looking on input coefficients, we get

$$\frac{a_y^A}{a_x^A} = \frac{10}{12} < \frac{9}{10} = \frac{a_y^B}{a_x^B}$$

which gives us the same comparative advantages as described above.

To become an exporter of y , B needs to have lower opportunity costs in the production of y than A . This can happen by becoming more productive in producing y **and/or** by becoming 'slower' in producing good x so that $\frac{a_y^B}{a_x^B} < \frac{10}{12}$

Exercise 3.12 — Comparative advantage and input coefficients

(Solution → p. 62)

Assume that only two countries, A and B , exist. Both countries are equally endowed with labor which is the only production factor. Both countries can produce either good y or good x . The table below gives the input coefficients, a , for both countries, i.e., the units of labor needed to produce one unit of good y and good x , respectively.

		Countries	
		A	B
Good y	400	2	
Good x	300	1	

- a) Name the country with an absolute advantage.
- b) Name the country with a comparative advantage in good y .
- c) Name the country with a comparative advantage in good x .

Solution to Exercise 3.12 — Comparative advantage and input coefficients (Exercise → p. 62)

- a) Country B has an absolute advantage in producing both goods.
- b) Country A has a comparative advantage in producing good y .
- c) Country B has a comparative advantage in producing good x .

Exercise 3.13 — Comparative advantage: Germany and Bangladesh

(Solution → p. 63)

The table below gives the unit of labor needed to produce one machine, one ship, and one cloth in Germany and Bangladesh.

	Machine	Ship	Cloth
Bangladesh	100	10000	50
Germany	5	50	3

- a) Which country has an absolute advantage in the production of machines, ships, and clothes?
- b) What is Germany's and Bangladesh's comparative advantage if we look only at machines and ships?
- c) What is Germany's and Bangladesh's comparative advantage if we look only at machines and clothes?
- d) What is Germany's and Bangladesh's comparative advantage if we look only at ships and clothes?
- e) Can you infer from the previous calculations which good Germany will export for sure and which good it will surely not export?

Solution to Exercise 3.13 — Comparative advantage: Germany and Bangladesh
 (Exercise → p. 62)

- a) Germany has an absolute advantage in the production of the three goods because its labor input coefficients are smaller in all three goods.
- b) Since $p_B^{m/s} = \frac{100}{10000} < p_G^{m/s} = \frac{5}{50}$, Bangladesh has a comparative advantage in producing machines and Germany has a comparative advantage in producing ships.
- c) Since $p_B^{m/c} = \frac{100}{50} > p_G^{m/c} = \frac{5}{3}$, Bangladesh has a comparative advantage in producing clothes and Germany has a comparative advantage in producing machines.
- d) Since $p_B^{s/c} = \frac{10000}{50} > p_G^{s/c} = \frac{50}{3}$, Bangladesh has a comparative advantage in producing clothes and Germany has a comparative advantage in producing ships.
- e) Germany has a clear comparative advantage in producing ships and hence will export ships. Moreover, Germany has a clear comparative disadvantage in producing cloth and will definitely import clothes.

Exercise 3.14 — Multiple choice: Ricardian model

(Solution → p. 63)

Assume that only two countries, A and B, exist. Both countries are equally endowed with labor which is the only production factor. Both countries can produce either good y or good x . The table below gives the input coefficients, a , for both countries, i.e., the units of labor needed to produce one unit of good y and good x , respectively.

Countries	
A	B
Good y	40 20
Good x	30 10

Which of the following statements is/are true?

- a) Country A has an absolute advantage in producing both goods.
- b) Country B has an absolute advantage in producing both goods.
- c) Country A has a comparative advantage in good y and a comparative disadvantage in good x .
- d) Country B has a comparative advantage in good y and a comparative disadvantage in good x .
- e) Trade will not occur between these two countries.

Solution to Exercise 3.14 — Multiple choice: Ricardian model (Exercise → p. 63)

Choices b) and c) are correct.

Exercise 3.15 — Ricardian Model again

(Solution → p. 64)

Assume that only two countries, A and B, exist. Both countries are equally endowed with the only production factor labor which can be used to produce either good y or good x . The table below gives input coefficients, a , for both countries, i.e., the units of labor needed to produce one unit of good y and good x , respectively.

Countries	
A	B
Good y	11 22
Good x	8 16

Which of the following statements is true?

- Country A will export good y and import good x .
- Country B will export good y and import good x .
- Country B has an absolute disadvantage in producing both goods.
- Trade will not occur between these two countries.

Solution to Exercise 3.15 — Ricardian Model again

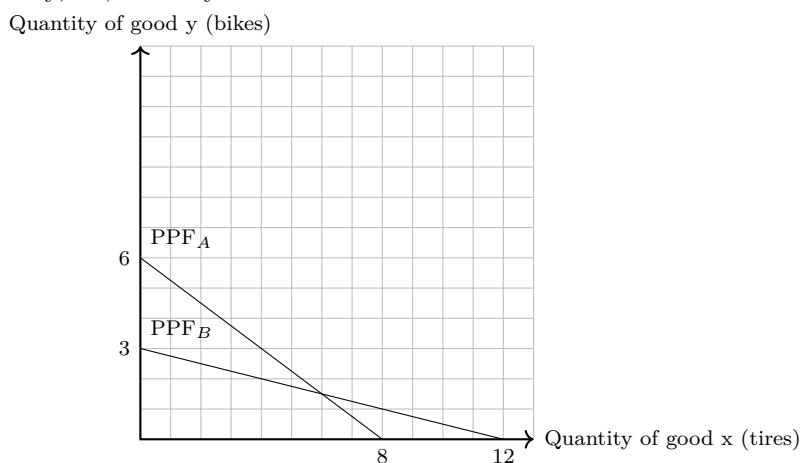
(Exercise → p. 63)

c) and d) are true.

Exercise 3.16 — Bikes and bike tires

(Solution → p. 65)

Consider two countries, A and B . Both have a labor endowment of 24, $L^A = L^B = 24$. In both countries two goods can be produced: bikes, which are denoted by y , and bike tires, which are denoted by x . Assume that the two goods can only be consumed in bundles of one bike and two bike tires. The following graph illustrates the production possibility (PPF) curve of both countries in autarky, i.e., country A and B do not trade with each other.



- How many **complete bikes**, i.e., one bike with two tires, can be consumed in autarky in country A and B , respectively. Draw the production points for country A and B into the figure. (A calculation is not necessary.)
- Calculate —for both countries—the input coefficients, a , i.e., the units of labor needed to produce one unit of good y and good x , respectively. Fill in the four input coefficients in the following table:

Countries	
A	B
Good y (bikes)	_____
Good x (bike tires)	_____

- Fill in the ten gaps (_____) in the following text:

If we assume that both countries specialize completely in the production of the good at which they have a comparative advantage and trade is allowed and free of costs, then

- country A produces _____ units of bikes and _____ units of tires and
- country B produces _____ units of bikes and _____ units of tires.

Moreover, since both countries aim to consume complete bikes, i.e., one bike with two tires,

- country A exports _____ units of _____ and imports _____ units of _____ and
- country B exports _____ units of _____ and imports _____ units of _____.

Under free trade

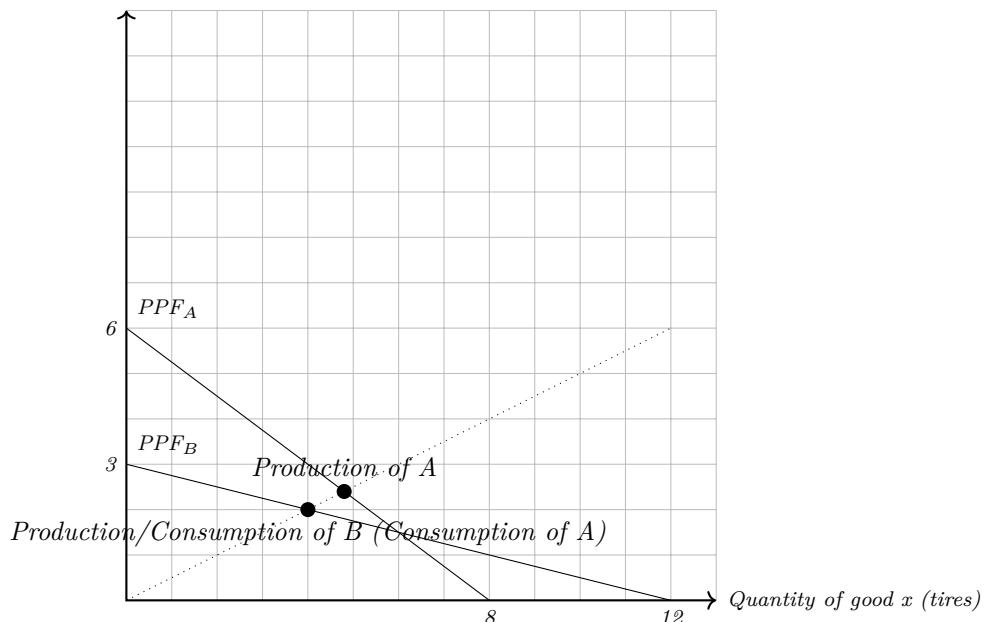
- country A can consume _____ complete bikes and
- country B can consume _____ complete bikes.

Solution to Exercise 3.16 — Bikes and bike tires

(Exercise → p. 64)

- a) Both countries can consume 2 complete bikes.

Quantity of good y (bikes)



- b) The table

input cooficients	Countries	
	A	B
Good y (bikes)	$24:6=4$	$24:3=8$
Good x (bike tires)	$24:8=3$	$24:12=2$

- c) If we assume that both countries specialize completely in the production of the good at which they have a comparative advantage and trade is allowed and free of costs, then

- country A produces 6 units of bikes and 0 units of tires and
- country B produces 0 units of bikes and 12 units of tires.

Moreover, since both countries aim to consume complete bikes, i.e., one bike with two tires,

- country A exports 3 units of bikes and imports 6 units of tires and
- country B exports 6 units of tires and imports 3 units of bikes.

Under free trade

- country A can consume 3 complete bikes and
- country B can consume 3 complete bikes.

Exercise 3.17 — Ricardian model MC

(Solution → p. 66)

Assume that only two countries, A and B, exist. Both countries are equally endowed with the only production factor labor which can be used to produce either good y or good x . The table below gives input coefficients, a , for both countries, i.e., the units of labor needed to produce one unit of good y and good x , respectively.

		Countries	
		A	B
Good <i>y</i>	321	899	
Good <i>x</i>	459	999	

Which of the following statements is true?

- a) Country A has an absolute advantage in both goods.
- b) Country A has an absolute advantage in good *y*.
- c) Country A has a comparative advantage in both goods.
- d) Country B has a comparative advantage in both goods.
- e) Country A has a comparative advantage in good *y*.
- f) Country B has a comparative advantage in good *y*.

Solution to Exercise 3.17 — Ricardian model MC

(Exercise → p. 65)

a), b), and e) are correct statements.

3.7 Trade because of different endowments (Heckscher-Ohlin model)

3.7.1 Nobel prize winning theory

The Model which we discuss in this section is named after two Swedish economist, Eli Heckscher (1879-1952) and Bertil Ohlin (1899-1979). Bertil Ohlin received the Nobel Prize in 1977 (together with James Meade). The HO-Model, as it is often abbreviated, was the main reason for the price. Here is an excerpt of the Award ceremony speech:

Your Majesties, Your Royal Highnesses, Ladies and Gentlemen,

The question why individuals, firms and nations exchange goods and services with each other, and how these processes are influenced by government policies, may be regarded as the basic issue in the science of economics. In the case of exchange between countries, the dominating theory was for a long time – from the beginning of the 19th century – David Ricardo's theory of comparative advantage. Ricardo explained there the structure of foreign trade by differences in the production technology between nations. Over the years the theory was gradually improved upon in various ways, but a more basic overhaul did not take place until Bertil Ohlin in the early 1930's published his work *Interregional and International Trade*, which is now a classic, and James Meade in the 1950's came out with his important volumes on *The Theory of International Economic Policy*.

Bertil Ohlin showed in this work, which to some extent was inspired by a remarkable article by Eli Heckscher, that foreign trade may arise even if the production technology were identical in different nations. It is enough that the supplies of the factors of production of various kinds – such as labor of different types, capital, and land – differ among nations. The starting point of Ohlin's theory is that a country tends to be an exporter of commodities that use relatively large amounts of the factors of production which are in ample supply as compared to domestic demand – in the hypothetical case without foreign trade. For instance, to take a simple example, if land is abundant in Australia while labor is relatively plentiful in England, we would expect Australia to be an exporter of commodities which for their production require much land, such as wool, while England would be an exporter of commodities the production of which requires relatively much labor, such as textiles.

From this simple theoretical structure, the so-called Heckscher-Ohlin model,

follow a number of interesting theorems. One of them, the factor price equalization theorem, tells us that foreign trade tends to equalize the prices of the factors of production in different countries. For instance, when Australia starts to export land-intensive goods, the demand for land goes up relative to labor, with a rise in land prices as a result, while the export of labor-intensive goods by England pulls up wages there relative to the price of land. Thus, trade in commodities tends to have the same effects on the prices of the factors of production as if the factors themselves could move freely between countries. In this sense, commodity trade is a substitute for international mobility of the factors of production. Another inference from Ohlin's theory is that a tariff on a labor-intensive good, such as textiles, affects the distribution of income in favor of labor in the importing country, while a tariff on a capital-intensive commodity, such as wool or steel, results in an income redistribution in favor of the owner of capital.

Source: <https://www.nobelprize.org/prizes/economic-sciences/1977/ceremony-speech>

The Ricardo model explains international trade as advantageous because of comparative advantages that are the result of technological differences. This means that comparative advantage in the Ricardian model is solely the result of **productivity differences**. The size of a country or the size of the countries' endowments does not matter for comparative advantage in the Ricardian model because there is only one factor of production in Ricardian models, namely labor. However, the assumption that there is only one factor of production is unrealistic, and we should ask what happens **if there is more than one factor of production but no productivity differences?** What happens if the two factors are available differently in different countries? What is the significance of endowment differences for international trade? And which owner of a factor of production will be a winner when a country opens up to world trade, and who will lose? The HO model can provide answers to these questions.

In [Table 3.1](#), I show that countries do indeed differ substantially in their total factor productivity, capital stock, and labor endowments, which are likely correlated with total population.

3.7.2 The Heckscher-Ohlin (factor proportions) model

Assumptions:

1. **Two countries:** Home country and foreign country. Variables referring to foreign countries are marked with an asterisk, *.
2. **Two goods:** x and y .
3. **Two factors of production:** K and L . This is new in relation to the Ricardian model! Let's name the factors K and L , which stands for capital and labor.
4. **Goods differ in terms of their need for factors of production:** $\frac{K_y}{L_y} \neq \frac{K_x}{L_x}$.

This means that one good must be produced in a capital-intensive way and the other in a labor-intensive way. If we assume that good y is capital intensive and good x is labor intensive in production, we can write:

$$\frac{K_y}{L_y} > \frac{K_x}{L_x}.$$

In this inequality, the quantity of capital required to produce good y , K_y , is on the left-hand side relative to the quantity of labor required to produce good y , L_y , i.e., the capital intensity of good y . The capital intensity of good x is on the right-hand side of the inequality. Rewriting this inequality, we can express it in terms of labor intensities: $\frac{L_y}{K_y} < \frac{L_x}{K_x}$. It should be clear that both inequalities say the same thing.

5. **No technology differences between countries:** Since we already know from Ricardian theory that productivity or technology differences are a source of international trade, we do not want to

explain the same thing again with the HO model. So we assume that all input coefficients are the same in all countries.

6. Different relative factor endowments: $\frac{K}{L} \neq \frac{K^*}{L^*}$

Since countries are assumed to have different factor endowments, the model links a country's trade pattern to its endowment of factors of production. The capital-labor ratio in the home country, $\frac{K}{L}$, must differ from the ratio abroad. Suppose the home country is capital-rich and the foreign country is labor-rich. Then we have the following ratios between capital and labor in the two countries:

$$\frac{K}{L} > \frac{K^*}{L^*}.$$

This means that the capital-labor ratio (a country's capital intensity) is higher in the home country than abroad. In terms of the ratio between labor and capital, i.e., the labor intensity of a country, this can be expressed as follows: $\frac{L}{K} < \frac{L^*}{K^*}$. It should be clear that both inequalities say the same thing.

- 7. Free factor movement between sectors** Both factors can be used in the production of both goods. Note that cross-country movement of factors (migration, foreign direct investment) is not allowed.
- 8. No trade costs** Final products can be traded without any costs.
- 9. Equal tastes in countries and homothetic preferences** Consumers in both countries have the same utility function. Homothetic preferences simply mean that for given relative prices, income does not affect the ratio of consumption.

3.7.3 Intuition

- Consider that the home country has relatively more capital and the foreign country relatively more labor and that the good y is capital intensive in production whereas the good x is labor intensive.
- Then it is relatively cheap for the home country to produce the capital-intensive good because it is endowed with a lot of capital, while it is relatively costly to produce the good with which the country is hardly endowed.
- Thus, the home country has a comparative advantage in producing the capital-intensive good.
- The opposite is true for the foreign country.

Eureka 3.6 — Heckscher-Ohlin Theorem

The capital abundant country exports the capital-intensive good. The labor abundant country exports the labor-intensive good.

Or:

A country export goods that are intensive in its relatively abundant factor and will import goods that are intensive in its relatively scarce factor.

- As a result of the Heckscher-Ohlin theorem, output of the good in which the country has a comparative advantage would increase. The capital intensive country will produce more capital intensive goods and the labor intensive country will produce more labor intensive goods.
- As the production of the good that makes intensive use of the abundant resource increases, the demand for that resource will also increase. Demand for the scarce resource will also increase, but to a lesser extent.

- If production of the good that intensively uses the scarce resource decreases, both abundant and scarce resources will be released, but relatively more of the scarce resource than of the abundant resource.
- In autarky, the relatively scarce factor in the home country was labor and factor prices were as follows:

$$\frac{w}{r} > \frac{w^*}{r^*}$$

- After opening to trade, production shifts to the home country so that the wage falls ($w \downarrow$) and the rent rises ($r \uparrow$).
- After opening to trade, production shifts abroad so that the wage rises, $w^* \uparrow$, and the rent falls, $w^* \downarrow$.
- This reallocation process, and hence the change in factor prices, continues until factor prices are equal in all countries:

$$\frac{w}{r} = \frac{w^*}{r^*}$$

- [Figure 3.13](#) visualizes this line of reasoning.
- I recommend a clip of Mike Moore explaining how trade based on factor endowments affects wages and returns to capital, see  <https://youtu.be/qk4tdP6ta78>

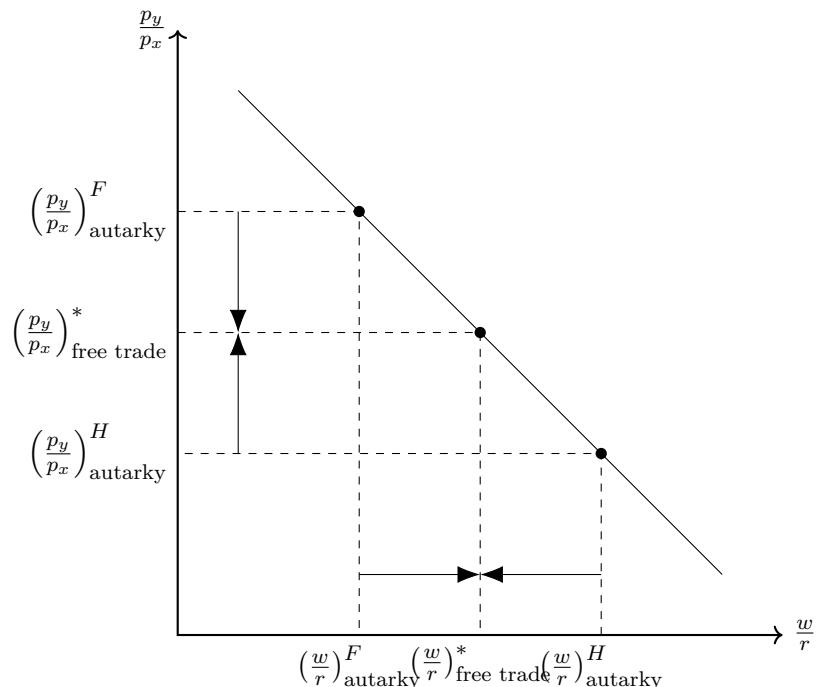


Figure 3.13: HO Model and factor prices

Eureka 3.7 — Factor-Price Equalization Theorem

The prices of the two factors of production (wage and rent) will be equalized across countries as a result of international trade in goods.

Why does the Factor-Price Equalization Theorem not (fully) hold?

In the real world, factor prices do not equalize due to frictions such as transportation costs, trade barriers, and the presence of goods that are rarely or never traded.

Trade as an alternative to factor movements

The factor price equalization theorem contains an interesting insight: if a country allows free trade in its products, it will automatically export the abundant factor indirectly in the form of goods that intensively use the abundant factor.

Exercise 3.18 — Ricardo and Heckscher-Ohlin

(Solution → p. ??)

- Discuss the main differences of the Ricardian Model and the Heckscher-Ohlin Model.
- Assume that only two countries, A and B, exist. Both countries are equally endowed with the only production factor labor which can be used to produce either good y or good x . The table below gives input coefficients, a , for both countries, i.e., the units of labor needed to produce one unit of good y and good x , respectively.

		Countries	
		A	B
Good y		10	11
Good x		1	2

Name the country with a comparative advantage in good y .

Exercise 3.19 — HO-Model in one figure

(Solution → p. 71)

Suppose consumers from country A and the foreign country B like to consume two goods that are neither perfect substitutes nor perfect complements. Moreover, assume for simplicity that both countries have the same size but have different endowments, as stated in the assumptions above. Moreover, assume the factor intensity of production as stated in the assumptions above.

- Sketch the production frontiers for both countries in autarky. Show graphically the relative price in autarky.
- You will see that the relative prices of goods differ across countries:

$$\left(\frac{p_1}{p_2}\right) \neq \left(\frac{p_1}{p_2}\right)^*$$

That means, the Home country A has a comparative advantage in producing good 1.

- Now, sketch the world market price that will maximize the utility.
- Where are the new production and consumption points of both countries?
- Show in the graphic how much each country trades.
- I recommend a clip of Mike Moore who also explains the HO-Model with production possibility curves, see  https://youtu.be/F_CfnAbytxk

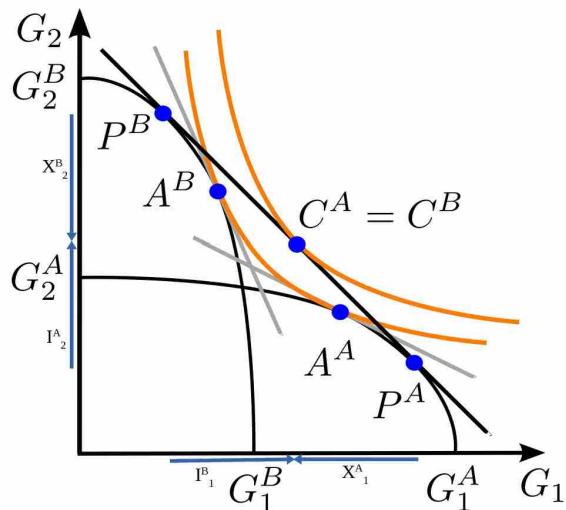


Figure 3.14: HO-Model in one figure

Source: Own drawing based on [Wikipedia \(2020\)](#).

Two identical countries (A and B) have different initial factor endowments. I assume that country A is abundantly endowed with the production factor that is intensively used in the production of good 1, the reverse holds for country B . Thus, the two solid black lines in 3.7.3 represents the respective production possibility frontier curves. The orange lines represents the respective indifference curves. Autarky equilibria are marked with A^A and A^B , respectively. The production points in trade equilibrium are marked with P^A and P^B , the consumption point of both countries is in $C^A = C^B$. Thus, production and consumption points are divergent. The indifference curve under free trade is clearly above the other indifference curve in autarky. The solid black line that is tangent to the consumption point under free trade represents the utility maximizing world market price under free trade. The exports, X , and imports; I , are denotes correspondingly to the goods and country names.

Exercise 3.20 — Multiple choice: HO-Model

(Solution → p. 71)

Given are the assumptions of the Heckscher-Ohlin Model. In particular, assume that only two countries, A and B , and two goods, y and x , exist. Consider the following data:

	Countries	
Factor Endowments	A	B
Labor Force	20	30
Capital Stock	30	40

If good y is capital intensive in production and good x is labor intensive in production then, following the Heckscher-Ohlin Theorem, ...

- a) ... country A will export good y .
- b) ... country B will export good y .
- c) ... both countries will export good y .
- d) ... trade will not occur between these two countries.

Solution to Exercise 3.20 — Multiple choice: HO-Model

(Exercise → p. 71)

Answer a) is correct.

Table 3.1: Endowment differences across countries in 2010

RegionCode	(1) Capital stock at current PPPs (in mil. 2011USD)	(2) Population (in millions)	(3) Capital stock per capita
ITA	10421041	60	174885
ESP	7806612	47	167518
FRA	10405968	65	160395
GBR	9973122	63	159019
DEU	12687682	80	157738
USA	48876336	310	157729
AUS	3332890	22	150382
CAN	5065392	34	148431
JPN	17161376	127	134790
SAU	3716382	28	132300
KOR	6052155	49	123287
TWN	2835890	23	122549
ROU	1271652	20	62647
VEN	1765996	29	60905
BRA	9869311	199	49691
RUS	6746460	143	47126
POL	1769004	39	45859
THA	2977965	67	44652
IRN	3234132	74	43555
ARG	1773984	41	43034
MEX	5054693	119	42613
TUR	2938288	72	40634
UKR	1616826	46	35420
IDN	8146254	242	33716
COL	1446480	46	31501
CHN	42218080	1341	31483
PER	681036	29	23185
PHL	1560017	93	16767
IRQ	443733	31	14375
IND	15356803	1231	12475

Source: Penn World Tables 9.0

3.8 The specific factor model



Source: <https://otherwords.org/wp-content/uploads/2015/03/Free-trade-at-last.jpg>

From the Ricardian model, we know that trade is a positive-sum game. If free trade is beneficial to a country, as Ricardo predicts, why isn't everyone happy with free trade? In democratic societies, policymakers sometimes adopt protectionist trade policies because of pressure from interest groups and public demand. The discrepancy between the promises and potential benefits of trade on the one hand and the negative consequences of free trade for many groups on the other is illustrated in [Figure 1.9 Free trade at last](#). The models so far do not give us a way to see which groups actually suffer from free trade, and thus we have no clue why there are incentives for interest groups to oppose free trade. Are anti-free trade policy preferences the result of ignorance, general worldviews, political ideology, environmental attitudes, social trust, or other factors? Well, these things may play a role, but there are also economic factors, i.e., the self-interest of individuals and groups within an economy, that can account for anti-free trade attitudes. In the following sections, we will discuss a theory that shows that

while free trade benefits countries as a whole, not everyone within a country benefits equally. Some benefit more than others, and some are actually made worse off by free trade.

In the next two subsections, we derive some key hypotheses that free trade favors those people in a country who have abundant factors of production and disadvantages those who have scarce factors. Moreover, free trade favors investors and workers in export-oriented industries with comparative advantages.

Assumptions

The sector-specific model, also known as the Ricard-Viner model, can show that there are winners and losers in international trade. The model is based on the following assumptions:

1. 2 countries $i \in \{A, B\}$
2. 2 goods (sectors) $g \in \{1, 2\}$
3. 3 factors of production: Labor L , capital specific to the production of good 1, K_1 , and capital specific to the production of good 2, K_2 ⁵. The technologies for the production of both goods are now represented by two production functions $Q_1 = F_1(K_1, L_1)$ and $Q_2 = F_2(K_2, L_2)$, where both factors of production have positive but decreasing marginal products
4. The capital allocated to each sector is fixed for both countries: $K_1 = \bar{K}_1, K_2 = \bar{K}_2$
5. The labor assigned to each sector (L_1 and L_2) can change in response to Response to external shocks: $\bar{L} = L_1 + L_2$
6. perfect competition
7. perfect market clearing (no unemployment)
8. country A is a small open economy (we consider only country A and therefore do not use a subscript for countries in the following)

The production possibility frontier with two factor inputs: The two production functions, the fixed endowments and the distribution of labor determine the aggregate PPF. The PPF, which is the product of two production functions (F_1 and F_2), is shown in Figure 3.15. The figure shows, for both production points A and B, how the mobile factor of production, labor, must be reallocated from sector 2 to sector 1 in order to produce more of good 1 in production point B. The second and fourth quadrants show the respective production functions of sectors 1 and 2.

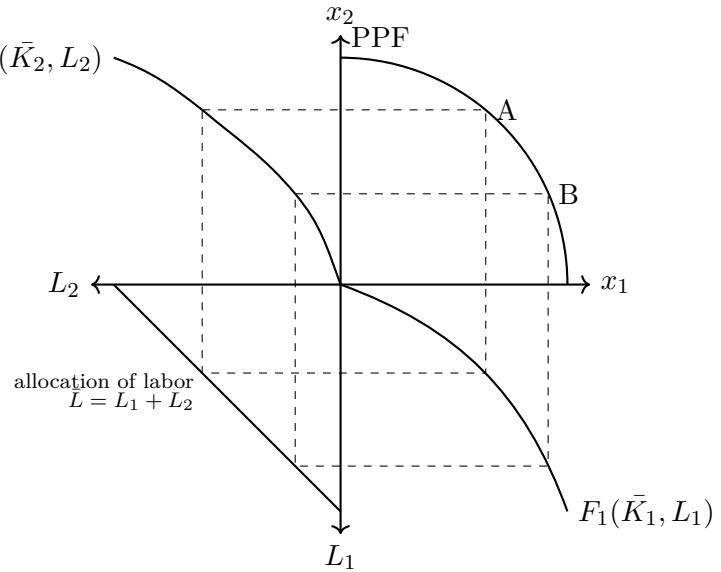


Figure 3.15: PPF with two factors and positive but declining marginal products

⁵You can think of capital specific to the production of manufacturing goods (good 1) and land specific to the production of food sector goods (good 2)

Equilibrium in autarky:

- Depending on a country's demand for good 1 and 2 a production point on the PPF is chosen at which it must hold that the slope of the PPF curve and the price relation (i.e., relation of marginal product of labor in sector 1 and sector 2) must be equal:

$$\frac{p_1}{p_2} = \frac{\frac{\partial F_2}{\partial L_2}}{\frac{\partial F_1}{\partial L_1}}$$

- What can we say about the rents of the production factors?
- From the assumption of perfect competition it follows that firms do not make a positive profit in equilibrium, $\pi \stackrel{!}{=} 0$. Thus, the equilibrium wage for sectors $g \in \{1, 2\}$ are given by the profit maximizing firms

$$\begin{aligned}\pi_g &= p_g \cdot F_g(\bar{K}_g, L_g) - w_g L_g - r_g K_g \\ \frac{\partial \pi_g}{\partial L_g} &= p_g \cdot \frac{\partial F_g}{\partial L_g} - w_g \stackrel{!}{=} 0 \quad \Leftrightarrow w_g = p_g \frac{\partial F_g}{\partial L_g}\end{aligned}$$

- We know that labor can move freely between sectors and an equilibrium exists when there are no incentives to move any further. That is the case when wages in both sectors are equal, $w_1 = w_2$. Thus, we can express wages in terms of purchasing power in units of good 1 as follows:

$$\begin{aligned}w_1 &= p_1 \frac{\partial F_1}{\partial L_1} \quad \text{and} \quad w_2 = p_2 \frac{\partial F_2}{\partial L_2} \\ \Rightarrow w &= p_1 \frac{\partial F_1}{\partial L_1} = p_2 \frac{\partial F_2}{\partial L_2} \\ \Leftrightarrow \frac{w}{p_1} &= \frac{\partial F_1}{\partial L_1} \\ \Leftrightarrow \frac{w}{p_2} &= \frac{\partial F_2}{\partial L_2}\end{aligned}$$

- Figure 3.16 presents the equilibrium wage and the optimal allocation of labor into sector 1 and 2.

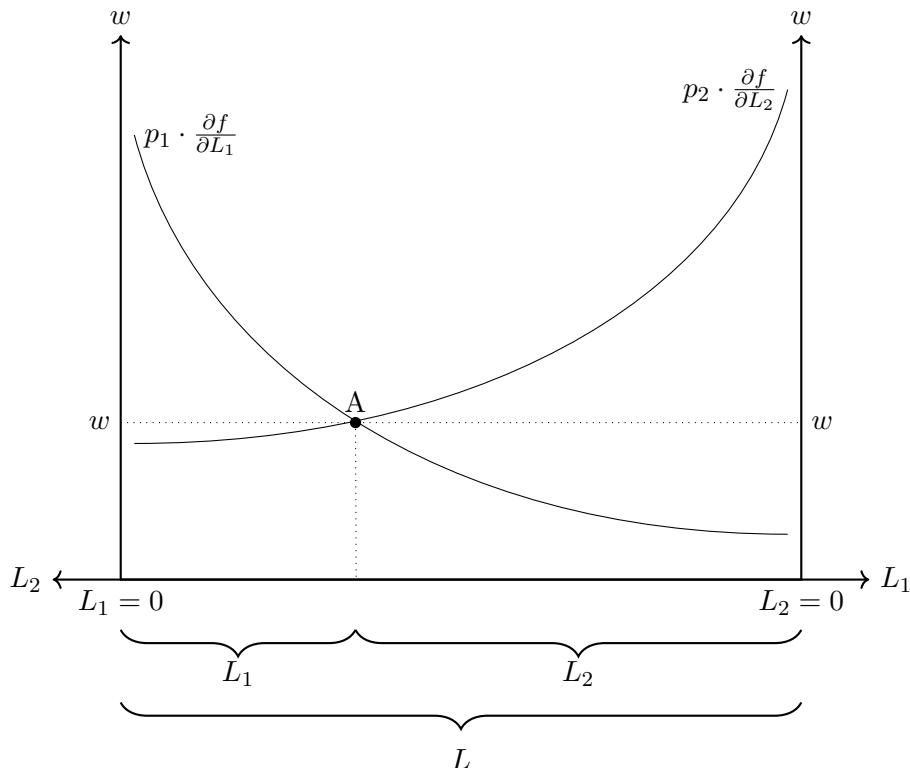


Figure 3.16: Equilibrium in autarky

Equilibrium under free trade: Assume the price of good 1 and good 2 increase due to a trade opening in the same proportion. What happens with the real wage and the real incomes of capital-1 and capital-2 owners? The answer is: no real changes occur.

- The wage rate, w , rises in the same proportion as the prices, so the real wages are unaffected. In [Figure 3.15](#) this can be shown by shifting both curves upward.
- The real incomes of capital owners also remain the same because there will be no reallocation of labor across sectors.

Now, assume only the price of good 1 rises for 10% while p_2 remains fixed, $\frac{p'_1}{p_2} > \frac{p_1}{p_2}$. What happens with the real wage and the real incomes of capital-1 and capital-2 owners? The answer is: some win, some lose, and some maybe win.

Wages:

- $p_1 \frac{\partial F_1}{\partial L_1}$ rises and hence labor reallocates from sector 2 to sector 1 ($L_1 \uparrow$ and $L_2 \downarrow$). This is shown in [Figure 3.17](#).
- This reallocation of labor has some implications for the real wages measured in purchasing power of good 1 and 2, respectively:
- The price of good 1 has increased by 10%, the wage has however increased by less than 10% (compare the length of BC and BD in the figure), whereas the price for food stays constant.
- Thus, the purchasing power in buying good 2 increased, whereas the purchasing power in buying good 1 decreased. Hence, workers gain when buying good 2 but lose when buying good 1
- Overall, the welfare effect from real wages is unclear and depends on preferences.

Owner of capital-1:

- Owners of capital-1 receive a 10% higher price on their products but have to pay a less than 10% higher wage.
- Overall, capital-1 owners gain from free trade because they can employ more workers (at a higher price) now.

Owner of capital-2:

- Owner of capital-2 receive the same price on their products but have to pay a higher wage.
- Overall, capital-2 owners lose from free trade because they can employ less workers at a higher price now.

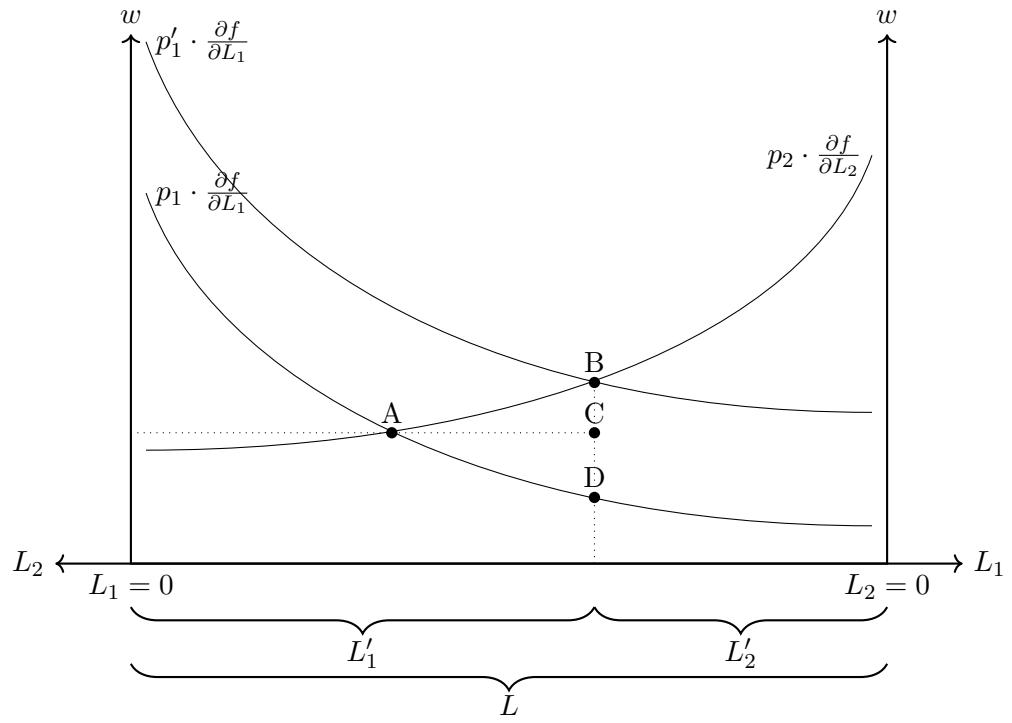


Figure 3.17: Equilibrium in autarky

Chapter 4

Trade policy

Plan In this chapter, we discuss countries' incentives and opportunities to influence trade flows and the welfare implications of trade policy. In particular, we provide information on how the World Trade Organization organizes the world trading system.



Figure 4.1: Biden and BUY AMERICAN
Foto: Jim Watson / AFP taken from www.spiegel.de

Exercise 4.1 — Buy local be happy?

(Solution → p. ??)

In many countries, including the U.S., people tend to believe that it is better to buy at home than abroad. Discuss whether or not buying locally can be a welfare-enhancing strategy. Thereto read the following excerpts:

www.buydirectusa.com: 15 Reasons to Buy American Made Products

Next time you are in a store or shopping online look for the Made in USA label. The job you save by doing so could one day be your own!

1. When you buy American products you support American workers. Existing jobs are saved and more employment opportunities are created.
2. When you buy American Made products you support companies that are doing business in America.
3. Hundreds of major American corporations are continuing to ship thousands of jobs overseas. Displacing the American worker.
4. Since 2000. the United States has lost an incredible 32% of its manufacturing jobs.
4. To prevent more of our manufacturing cities all over America from being transformed from thriving communities into crime infested hellholes. What happened to Flint, MI and Camden, NJ can happen in any American city when corporations

- decide to move production overseas.
6. China is now the number one supplier of components that are critical to the operation of US defense systems. Does this bother anyone else?
 7. According to the Economic Policy Institute The economy has been unable to create jobs due to America's massive trade deficit.
 8. U.S. trade policies encourage businesses to relocate production of goods to other nations without penalizing them for selling those goods back to the United States. This has resulted in millions of lost jobs for the American people.
 9. Since 1975, the US has imported more goods than it has exported. In 2010, the US had a deficit of \$478 billion in global trade.
 10. Over 30 years of trade policies such as NAFTA and CAFTA have taken jobs from the American people.
 11. For every \$1 billion in goods imported, the economy loses 9,000 jobs.
 12. No regulation or safety standards in products made overseas. Chinese-made drywall used in US homes is creating health and safety hazards.
 13. Moral implications of the exploitation of foreign workers and violations of child labor laws overseas.
 14. Environmental standards are minimal or non-existent in how products are made overseas. This has an impact on everyone on the planet.
 15. Chinese imports accounted for more than 60% of the recalls announced by the Consumer Product Safety Commission in 2007
- UPDATE**
16. COVID – Where did that get released from?
 17. When you buy products from the CCP, you are helping to fund their military which are a growing threat around the globe.
 18. You don't have to swim to get the products you need.

[Statement of The White House on July 28, 2021](#)

“The President believes that when we spend American taxpayers’ dollars, it should support American workers and businesses. In his first week in office, President Biden signed Executive Order 14005, Ensuring the Future is Made in All of America by All of America’s Workers, launching a whole-of-government initiative to strengthen the use of federal procurement to support American manufacturing.”

[Federal Reserve Bank of Dallas \(2002, p. 16\)](#)

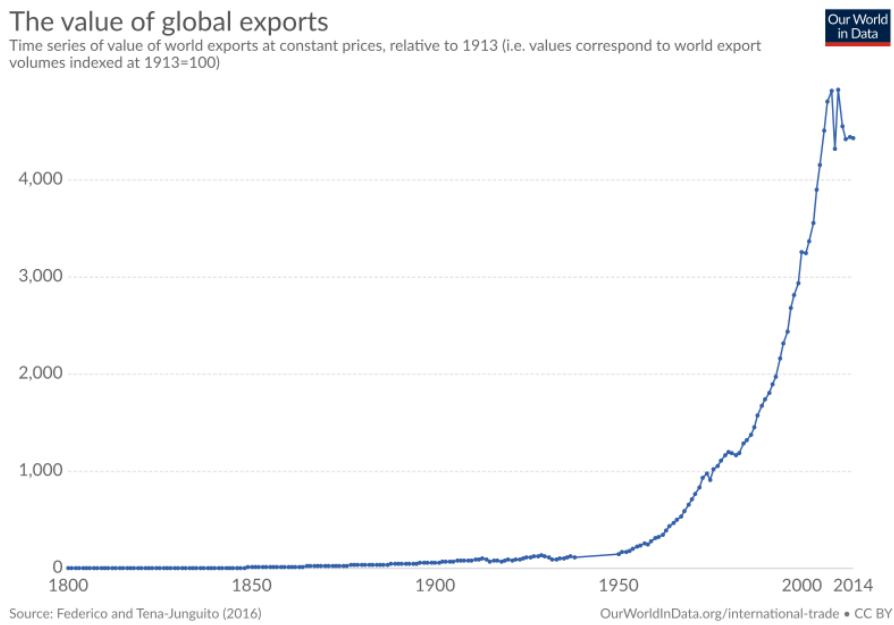
“A common myth is that it’s better for Americans to spend their money at home than abroad. The best way to expose the fallacy in this argument is to take it to its logical extreme. If it’s better for me to spend my money here than abroad, then it’s even better to buy in Texas than in New York, better yet to buy in Dallas than in Houston... in my own neighborhood ... within my own family... to consume only what I can produce. Alone and poor.”

4.1 Stylized facts on trade openness

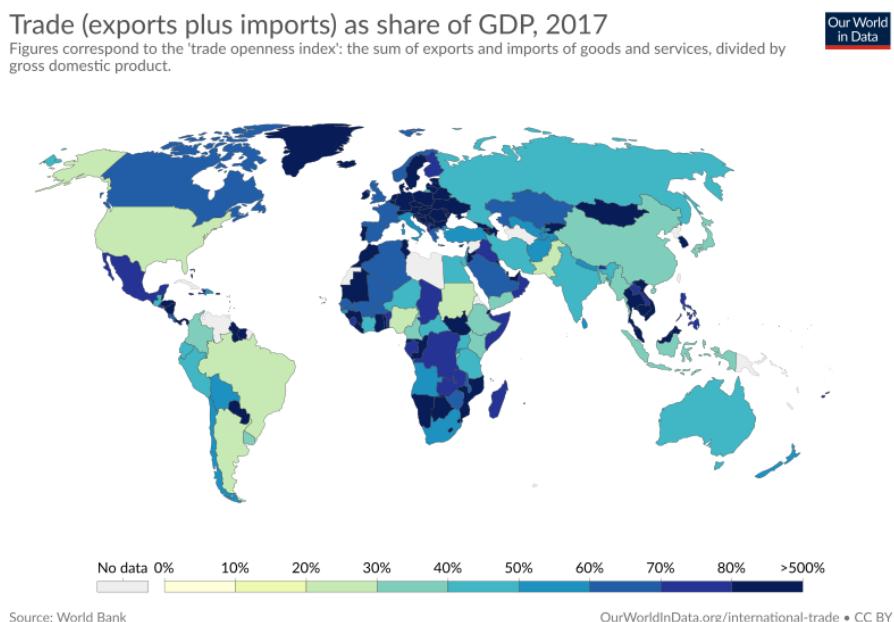
Trade Openness refers to the outward or inward orientation of a given country’s economy and touches many things including:

1. **Trade openness:** trade to GDP ratio
2. **Trade policy regime:** tariff profile, border efficiency, ...
3. **Openness to FDI:** FDI inflow to GDP, ease of doing business
4. **Infrastructure:** logistics performance, communications infrastructure, telephone lines, Internet
5. **Political regime:** stability, democratic, open minded, reliable, ...

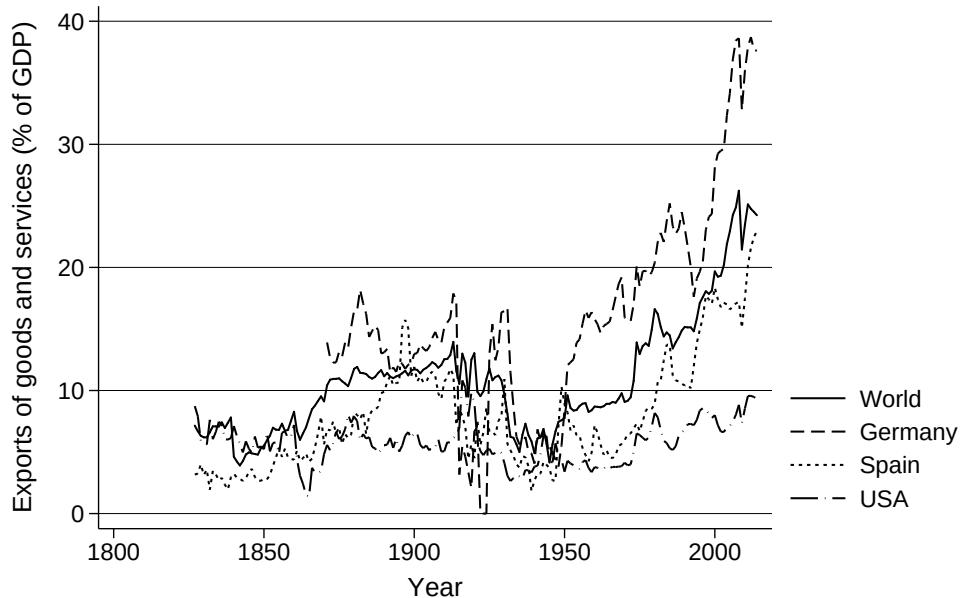
Trade has grown more than proportionately with GDP



Overall, the World is connected nowadays



The growth in trade is not God-given



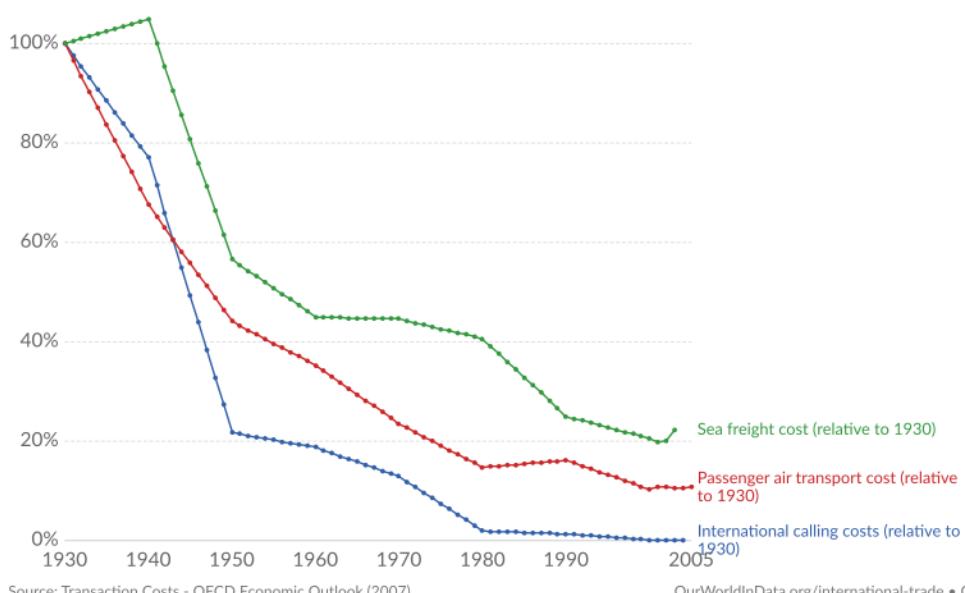
Source: World Bank

The second wave of globalization was enabled by technology

The decline of transport and communication costs relative to 1930

Sea freight corresponds to average international freight charges per tonne. Passenger air transport corresponds to average airline revenue per passenger mile until 2000 spliced to US import air passenger fares afterwards. International calls correspond to cost of a three-minute call from New York to London.

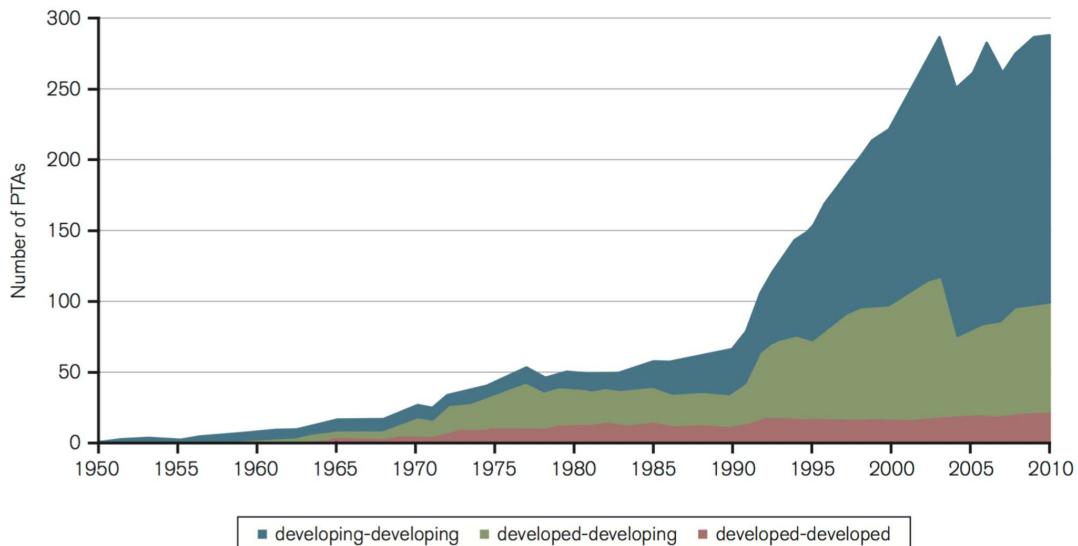
Our World
in Data



Source: Transaction Costs - OECD Economic Outlook (2007)

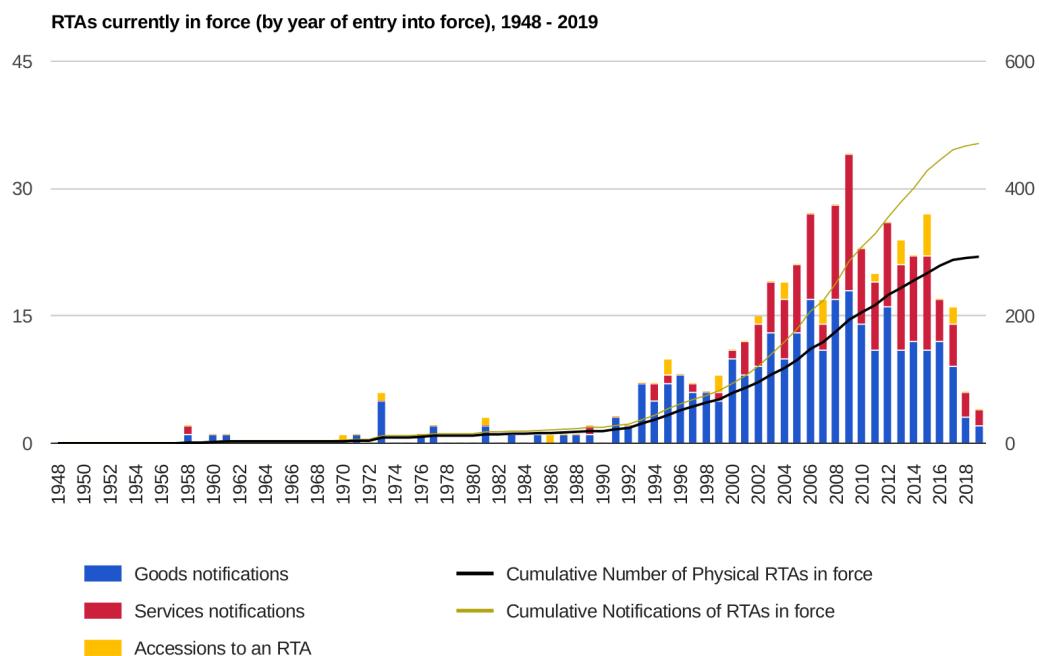
OurWorldInData.org/international-trade • CC BY

...and trade agreements



Source: WTO Secretariat.

Regional Trade Agreements in force



Source: WTO

4.2 World Trade Organization



The World Trade Organization (WTO) is an intergovernmental organization that regulates international trade and replaced in 1995 the General Agreement on Tariffs and Trade (GATT). 164 (!) countries are currently member of the WTO. The WTO facilitates the smooth and free flow of global trade through the administration and monitoring of a rules-based system that should among others help to make international trade (policy) more predictable. This set of rules is embodied in the WTO Agreements which are based on basic principles, that are:

► Watch: <https://youtu.be/3Gqq2sBWai4> *The World Trade Organization (WTO) • Explained With Maps*

1. Non-discrimination:

- The **Most Favoured Nation rule (MFN)** ensures non-discrimination between trading partners as it states that if a WTO member grants a country an advantage, it has to give such advantage to all WTO members. Thus, a WTO member has to grant the most favorable conditions under which it allows trade in a certain product type to all other WTO members. However, there is no rule without an exceptions.^a
► Watch: https://youtu.be/Q5_Bh-Y48_E *E-Learning short videos - Most-favoured nation (MFN)*
- The **National Treatment Principle (NTP)** ensures non-discrimination between domestic and foreign products or services. It prohibits a member from favoring its domestic products over imported products. The NTP aims to provide equality of competitive conditions for imported products in relation to domestic products. Again, no rule without exceptions.^b
► Watch: <https://youtu.be/y1DW-xPGgdI> *E-Learning short videos - The National Treatment Principle*

2. **Transparency:** WTO members must publish their trade regulations and changes therein. Moreover, members should respond to requests for information by other members.

3. **More open and predictable trade:** While the use of tariffs and quotas is not prohibited, members have committed to carry out multilateral negotiations periodically with a view to reduce the general level of trade barriers.

^aFor example, a member may provide preferential treatment only to some countries within a free trade area or customs union, without having to extend such better treatment to all members. Another exception enables developed members to give unilateral preferential treatment to goods imported from developing countries and least-developed countries (LDCs), without having to extend such better treatment to other members.

^bFor example, there may be a security need to develop and purchase products domestically, or government procurement may, as is often the case, be used as a policy tool to promote smaller business, local industry or advanced technologies, see GATT Article III:8(a). ► Watch: <https://youtu.be/7o0jjajYcnk> *E-Learning short videos - General Exceptions*

4.3 Dispute settlement body

To make decisions on trade disputes between governments that are adjudicated by the organization, the WTO has established the Dispute Settlement Body (DSB). The Dispute Settlement Body is a meeting of the WTO General Council that brings together all representatives of WTO member governments, usually at the ambassador level. Any WTO member that believes another member is in violation of an obligation or WTO rule can file a complaint. The goal of the Dispute Settlement Body is then to find a solution to the dispute, including any violation. The first step is consultations between governments. If the dispute cannot be resolved through discussions, the DSB makes a decision and the offending country is ordered to correct its policies. In most cases, countries find a mutually acceptable solution

to the dispute. If the offending country does not correct its policy or provide other compensation, the WTO authorizes retaliatory action by the complaining country against the offending country. The adjudication process can take some time, as can the implementation of remedies to enforce or compensate for the violation of a WTO rule. [Figure 4.3](#) provides an overview of the average number of active, i.e., unresolved, complaints in recent years.

Up-to-date sources of information

- Book about trade disputes from 1995 to 2020: Organization, W. T. (2010). *WTO Dispute Settlement: One-page Case Summaries 1995–2020*. World Trade Organization
- WTO: Dispute settlement
- Map of disputes between WTO Members

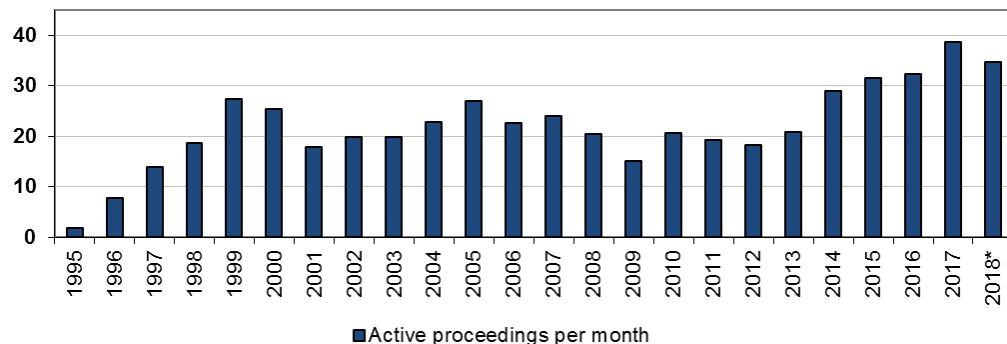


Figure 4.2: Average annual number of active proceedings per month 1995-2018

Annual averages are calculated on the basis of the number of active proceedings per month (January to December) over the yearly period concerned (e.g. in 2017, 39 proceedings were active per month, on average). The 2018 average is based on the number of active proceedings in January, February and March.

Source: www.wto.org

Duration of Each Stage of Proceedings

	Average length of process, months	Statutory deadline	Mean
Consultations	From the date of Request of consultations to the establishment of panel	2 months	6.6
Panel proceedings	From the establishment of panel to circulation of the panel report	6 months	15.1
Appeals	From the date of the Notice of Appeal until the date of the circulation of the Appellate Body	2–3 months	3.3
RPT, Bilateral agreement	Total length of agreed period between parties of RPT during which implementation must occur.		11.6
RPT, Arbitration Award	The average RPT awarded by the arbitrator in the awards circulated.		9.6
Compliance panel	From the date of the request to establish a first compliance panel until the date of circulation of the Compliance Panel Report.	3 months	8.7
AB compliance	From the date of the first Notice of Appeal until the date of circulation of the Appellate Body compliance report.		3.4

Source: [Johannesson and Mavroidis \(2017\)](https://doi.org/10.1007/978-3-319-54052-7_4)

Most Active Countries at the WTO

Member State:	As Complainant	As Respondent	Complainant + Respondent	As Third Party
United States	114	130	244	140
European Union ²⁴	97	84	181	165
Canada	35	20	55	119
China ²⁵	15	39	54	139
India	23	24	47	128
Brazil	31	16	47	111
Argentina	20	22	44	60
Japan	23	15	38	170
Mexico	24	14	38	82
Korea	17	16	33	112

Source: [Reich \(2017\)](#)

Referring to [Reich \(2017\)](#) the USA was a *sinner*. The US was also the respondent in a relatively high proportion of all issued panel reports, namely in 38% of them (78 out 207). However, this high rate of US participation as respondent to complaints on trade violations is still much lower than its share in suspension requests. In the years I reviewed, there were 75 complainants that prevailed over the US. These are the cases where there is a potential for suspension requests in case of non-compliance. Indeed, 26 of these complainants ended up submitting suspension requests against the US.¹ That corresponds to 34.6% of the total. In other words, more than one third of the complainants who prevailed over the US in dispute settlement procedures, were forced to turn to trade sanctions in their effort to obtain compliance by the US.

When China acceded to the WTO, many scholars and policy makers were very skeptical about the willingness and ability of China to comply with international trading rules. However, the number of suspension requests that have been filed against China is zero (at the time when [Reich \(2017\)](#) published his study). China's record on compliance, at least for now and at least as measured by the number of suspension requests filed against it, seems to be perfect.

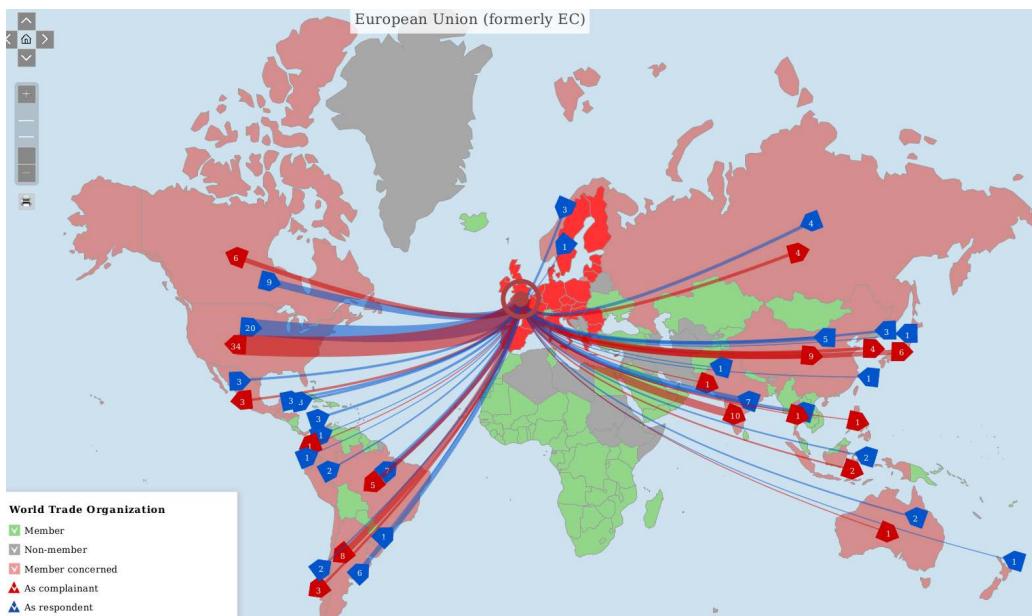


Figure 4.3: Map of disputes between the European Union and the Rest of the World

Source: www.wto.org

¹Suspension requests are the “last station” on the long winding road of the WTO dispute settlement procedures and they represent the targeted member state’s unwillingness to submit to the system and to respect its international obligations.

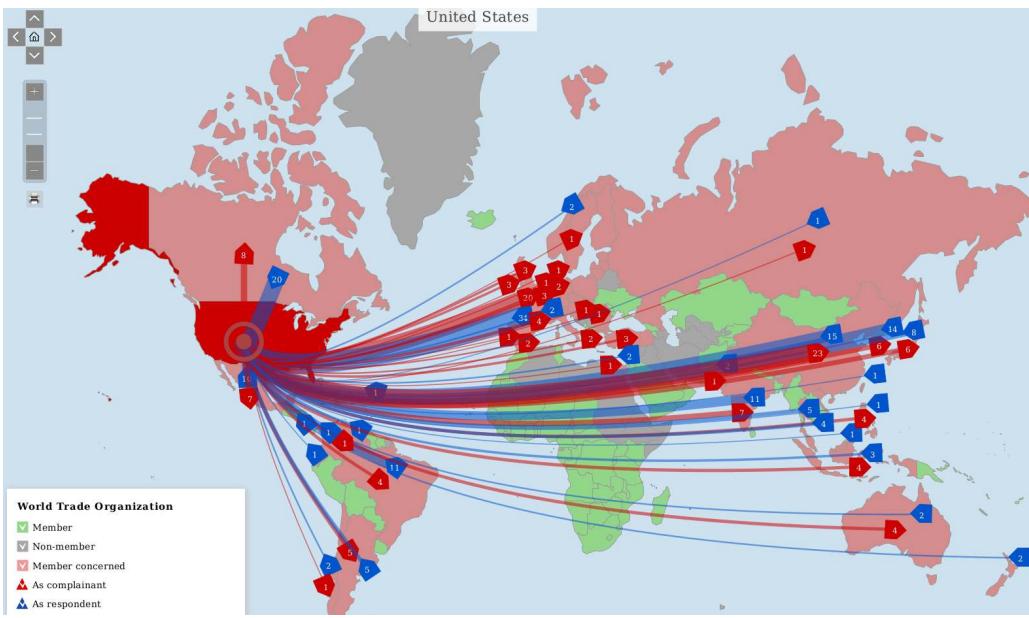


Figure 4.4: Map of disputes between the United States and the Rest of the World

Source: www.wto.org

Exercise 4.2 — God's diplomacy

(Solution → p. ??)



Watch the speech of Boris Johnson:

➡ <https://twitter.com/mattwridley/status/1224392062587604994?s=20>

What is meant with *free trade is god's diplomacy*?

4.4 The Regional Comprehensive Economic Partnership (RCEP)



Leaders and trade ministers of 15 Regional Comprehensive Economic Partnership (RCEP) countries pose for a virtual group photo in Hanoi, Vietnam on Sunday, Nov. 15, 2020. - [ASSOCIATED PRESS](#)

The leaders of China and another 14 countries in the Asia-Pacific region have signed one of the biggest free trade deals in history, covering 2.2 billion people and 30% of the world's economic output. The deal will cover nearly 28% of global trade.

The Regional Comprehensive Economic Partnership (RCEP) was signed over a video link on November 15th after eight years of negotiations.

The deal sets the terms of trade in goods and services, cross-border investment and new rules for increasingly important areas such as electronic commerce and intellectual property. The effect on the trade of finished goods between Asian nations will be particularly marked, analysts have said.

Trade and investment flows within Asia have vastly expanded over the past decade, a trend that has accelerated amid feuding between the US and China, in which the two superpowers have imposed billions of dollars' worth of punitive tariffs on each other's exports.

Unlike the CPTPP – the Comprehensive and Progressive Agreement for Trans-Pacific Partnership – and the EU, it does not establish unified standards on labor and the environment or commit countries to open services and other vulnerable areas of their economies.

Donald Trump in 2017 pulled out of the Trans-Pacific Partnership, a deal previously envisaged as a way of curbing China's influence.

4.5 Trade dispute between the USA and the European Union

Watch: <https://youtu.be/P20hfgeAWb4> *Trade Wars: How they work and who they impact*

In November 2021, President Biden has signed a deal to end tariffs on steel imports from the EU, which were imposed by his predecessor Donald Trump. But the agreement does not cover exports from the UK, putting British steelmakers at a disadvantage as is discussed in an article of the BBC, see [UK steel makers 'left behind' as US ends trade war](#).

In June 2018, the U.S. government imposed tariffs on €6.4 billion worth of European steel and aluminum exports, followed by additional tariffs in January 2020 affecting approximately €40 million worth of EU exports of certain steel and aluminum derivatives. The EU imposed countervailing measures on

€2.8 billion worth of U.S. exports to the EU in June 2018 (a similar EU response followed the second set of U.S. tariffs in 2020). The remaining countervailing measures, affecting up to €3.6 billion worth of exports, were scheduled to take effect on June 1, 2021. The EU suspended these measures until December 1, 2021, to allow the parties to work together on a longer-term solution. Following today's announcement by the U.S., these measures will not be imposed. ([European Commission, 2021](#))



Figure 4.5: Biden and von der Leyen on G20 leaders' summit in Rome, October 31,
Source: [REUTERS/Kevin Lamarque](#)

In November 2021, President Biden has signed a deal to end tariffs on steel imports from the EU, which were imposed by his predecessor Donald Trump. But the agreement does not cover exports from the UK, putting British steelmakers at a disadvantage as is discussed in an article of the BBC, see [UK steel makers 'left behind' as US ends trade war](#).

Boeing vs. Airbus

Boeing has continually protested over launch aid in the form of credits to Airbus, while Airbus has argued that Boeing receives illegal subsidies through military and research contracts and tax breaks. All that yielded litigation at the WTO and a series of decisions that allowed (trade) penalties of both sides.

For example, on 2 October 2019, the WTO approved US tariffs on \$7.5 billion worth of European goods, and officially authorized them on 14 October, despite the European Union urging for a negotiated settlement. On 30 September 2020, however, the WTO approved the European Union's retaliatory tariffs on \$4.1 billion worth of US goods, this is in addition to the previous unimplemented sanction allowing the EU the right to impose tariffs of up to \$8.2 billion on US goods and services

This is a trade war where nobody will probably be better off in the end. For more details on this dispute, I recommend the Wikipedia entry here, see: <https://t1p.de/o0ph>.

On June 15, 2021, the U.S. and the EU achieved a major breakthrough in the trade dispute between Boeing and Airbus, agreeing to end the 17-year dispute. All tariffs were suspended for five years.

4.6 Trump and trade

4.6.1 Trump vs. the European Union a.k.a. Jean-Claude Juncker

Donald J. Trump (@realDonaldTrump) March 3, 2018:

"The United States has an \$800 Billion Dollar Yearly Trade Deficit because of our 'very stupid' trade deals and policies. Our jobs and wealth are being given to other countries that have taken advantage of us for years. They laugh at what fools our leaders have been. No more!"

Jean-Claude Juncker, March 2, see [euronews.com](#):

"So now we will also impose import tariffs. This is basically a stupid process, the fact that we have to do this. But we have to do it. We will now impose tariffs on motorcycles, Harley Davidson, on blue jeans, Levis, on Bourbon. We can also do stupid. We also have to be this stupid."

Donald J. Trump (@realDonaldTrump) March 3, 2018:

"If the E.U. wants to further increase their already massive tariffs and barriers on U.S. companies doing business there, we will simply apply a Tax on their Cars which freely pour into the U.S. They make it impossible for our cars (and more) to sell there. Big trade imbalance!"

Under president Trump, United States imposed tariffs on goods such as cars, olives, single malt whiskey, pecorino cheese, and wine. The EU, in turn, has raised tariffs on goods such as orange juice, bourbon, peanut butter, power boats, and Harley-Davidson motorcycles.



Figure 4.6: Juncker and Trump make a deal
Source: [YouTube.de](#)

On July 25, 2020, Jean-Claude Juncker and Donald J. Trump met at the White House to discuss the ongoing trade dispute. They announced that the United States and the European Union would work to reduce tensions created by Trump's confrontational trade policies in the past.

4.6.2 Trump and the WTO

Read the following excerpt of an article by Bryce Baschuk at www.bloomberg.com² on 21. November 2018:

Trump Trade Fight Heads to Global Court as WTO Nears the Rubicon The Geneva-based WTO has long avoided this politically fraught confrontation, which could irreparably harm the organization tasked with deciding international trade disputes. But barring any unforeseen developments, the WTO on Nov. 21 will grant requests from members including China and the European Union to determine if U.S. steel and aluminum tariffs imposed in March – and based on national security concerns – are legal.

U.S. trade officials say that the WTO has no authority to mediate national security matters and should simply issue a decision that says the matter is outside of the WTO's remit. WTO Director-General Roberto Azevedo has gone so far as to warn countries against taking this dispute to the WTO, arguing that it instead "requires conversation at the highest political level." The fight could end up sidelining the WTO.

"If the WTO finds that Trump's tariffs are permitted under the national security exception, it opens a gaping hole that would allow any other country the right to impose trade barriers on any product at any moment and for no particular reason other than protectionism" Chad Bown, a senior fellow at the Washington-based Peterson Institute for International Economics, said in an interview. “”

In applying the tariffs, Washington relied on a rarely-used WTO national security exemption, which permits governments to take "any action which it considers necessary for the protection of its essential security interests." The Trump administration has already blocked the process once, and since the rules don't allow

²www.bloomberg.com/news/articles/2018-11-20/trump-trade-fight-heads-to-global-court-as-wto-nears-the-rubicon

further preventative actions, the WTO will likely create a dispute settlement panel, which would consist of three experts. Any decision would likely be rendered in 2019 or 2020.

4.6.3 Trump and his trade war with China

Donald J. Trump said in his 2016 presidential campaign:³

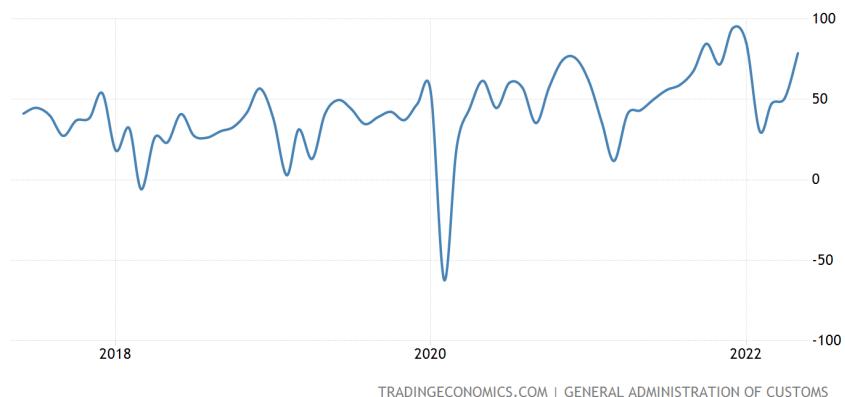
"We allowed foreign countries to subsidize their goods, devalue their currencies, violate their agreements and cheat in every way imaginable, and our politicians did nothing about it. Trillions of our dollars and millions of our jobs flowed overseas as a result. I have visited cities and towns across this country where one-third or even half of manufacturing jobs have been wiped out in the last 20 years. Today, we import nearly \$800 billion more in goods than we export. We can't continue to do that. This is not some natural disaster, it's a political and politician-made disaster. Very simple. And it can be corrected and we can correct it fast when we have people with the right thinking. Right up here. [...] To understand why trade reform creates jobs, and it creates a lot of them, we need to understand how all nations grow and prosper. Massive trade deficits subtract directly from our gross domestic product. From 1947 to 2001, a span of over five decades, our inflation-adjusted Gross Domestic Product grew at a rate of 3.5 percent. However, since 2002, the year after we fully opened our markets to Chinese imports, the GDP growth rate has been cut in half. [...] A Trump administration will change our failed trade policies, and I mean quickly."

I don't want to go into details about the trade disputes of China and USA. A nice and continually revised overview is offered by Wikipedia, see <https://t1p.de/y216>.

The following charts show the trade surplus/deficit (exports minus imports) for the USA, China, Russia, and Germany. The data were downloaded on 15th of June 2022 from <https://tradingeconomics.com>.



Figure 4.7: United States: Balance of Trade



³See: <https://time.com/4386335/donald-trump-trade-speech-transcript/>

Figure 4.8: China: Balance of Trade



Figure 4.9: Russia: Balance of Trade

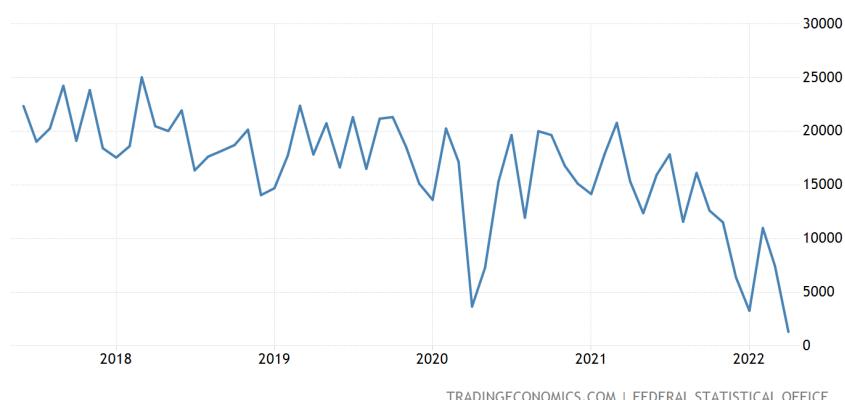


Figure 4.10: Germany: Balance of Trade

The charts indicate that Trump was not successful in reducing the trade deficit. Overall, it seems to be the case that trade wars are not that easy to win with respect to trade deficit and that it is not that easy to create jobs and boost the economy with starting trade disputes. For those who are interested: Here is a well researched article about that topic by Ryan Hass and Abraham Denmark, entitled *More pain than gain: How the US-China trade war hurt America*. see: <https://tip.de/2xob>.

Exercise 4.3 — Trump complains about the WTO

(Solution → p. 91)

- a) In an interview Donald Trump said

[...] I called NAFTA the second-worst trade deal ever made. I would say the WTO was the single worst trade deal ever made.

And if they don't shape up, I would withdraw from the WTO. We rarely won a lawsuit except for the last year. You know, in the last year, we're starting to win a lot. You know why? Because they know if we don't, I'm out of there. I'll take them out.^a

Discuss the legal constitution of the WTO and whether Donald Trump is right when he claims that other countries treat the United States unfair.

- b) WTO members are not permitted to increase import tariffs without justification. An exception to this rule, however, is given when the 'national security' of a nation is at risk. On this basis (which has been challenged within the WTO by several nations, including Canada), U.S. President Trump has issued executive orders imposing import tariffs on steel and aluminum imports for a set of different countries.

Discuss whether this behavior can be considered as fair.

^aSource: <https://www.bloomberg.com/news/articles/2018-08-31/president-donald-trump-interviewed-by>

Solution to Exercise 4.3 — Trump complains about the WTO (Exercise → p. 90)

- a) *Trump's claims are difficult to assess because it is unclear what he means by fairness or how to define fairness in trade relations in general.*

When referencing WTO rules, U.S. policy is far from a model of fairness to others, as too many countries have sued the U.S. for its discriminatory policies. Although he is wrong in his claim that the U.S. has "rarely won a lawsuit, with the exception of last year" (the U.S. win rate is similar to the average win rate), the U.S. is the country that has sued other members more often than any other country. For a more in-depth discussion, I recommend the article Why Trump's wrong about WTO treating US unfairly

- b) *Imposing and increasing tariffs based on the exception rule could irreparably damage the WTO's authority to adjudicate trade disputes. This is because U.S. trade representatives contend that the WTO does not have the authority to mediate national security issues and should simply issue a ruling that the matter is not within the WTO's jurisdiction. This argument puts a gun to the WTO's head. If the WTO's Dispute Settlement Body follows this line of reasoning, any country could easily impose tariffs in the future, citing national security, without the WTO being able to judge whether or not the issue is truly one of national security. This reminds (me) of the Mexican standoff, i.e., a confrontation between three or more parties in which there is no strategy that allows one party to win.*

4.7 Arguments for trade restrictions

There are hundreds of plausible arguments to restrict international trade. Here is a in-comprehensive list of often stated arguments. Each one is a topic of its own and it needs further investigation whether these arguments are really valid arguments for restricting trade.

The desire to reduce domestic unemployment

As we learned in the previous sections, the domestic production is the result of the world market price in the long-run. However, in the short run this means that production factors need to reallocate from one sector to the other. So far, we assumed that this reallocation happens without any frictions. Thus, we just moved along the PPF curve. In reality the transformation process is costly because the people loose their jobs without finding a job in another sector instantaneously without any costs. In reality a transformation process comes along with costs such as social costs and search and matching costs. Thus, it can be a rational strategy to decrease the reallocation/transformation pressure in order to organize the reallocation of production factors properly holding the external negative effects of transformation low. Nevertheless, we should not forget that (in the long run) reallocation of production factors and the adaption of new technologies is basically one of the most important sources of welfare growth, if not the only source.

The key enabling technology argument

If domestic industries are fostered, there might be technological spillovers to other industries in the country. As the government internalizes these spillovers, they have an incentive to protect and support these key to growth industries and technologies, respectively.

The need to counteract dumping in international trade

Selling goods in a foreign market below the price charged domestically can be called dumping. This sort of price competition is harmful when foreign producers hamper competition and discourage innovation and upgrading. For example, predatory dumping can give arguments for anti-dumping

policy interventions. Predatory dumping is a type of anti-competitive behavior in which a foreign company prices its products below market value in an attempt to drive out domestic competition. This may lead to conditions where the company has a monopoly in a certain product or industry in the targeted market with bad implications for social welfare.

The government revenue argument

Government can finance their budget by raising tariffs.

The national defense argument

National defense is an obviously legitimate goal for any sovereign government and hence, domestic industries that supply goods and services that are important for a potential military emergency should have a special protection.

The wish to decrease the national balance of payments deficit

Countries that have a large trade deficit wish—for whatever reason (see section 2.5)—to increase import restrictions in order to decrease the export deficit.

The income redistribution argument

As we have learned, trade generates winners and losers and hence is a source for the distribution of wealth. Government can use this knowledge to redistribute income or decrease income inequality. However, it is almost certain that this politic is not the most efficient and best way to achieve the said goals because we have also learned that trade is beneficial for a country as a whole.

The infant industry argument

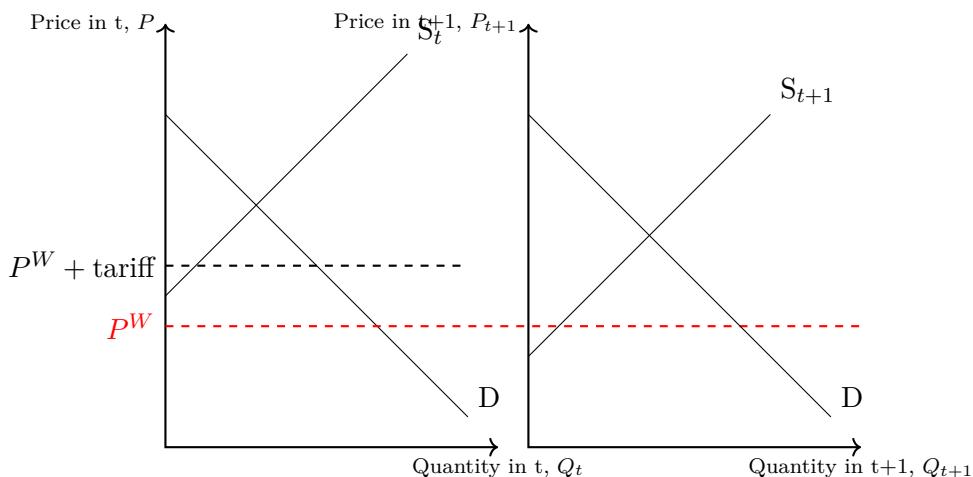


Figure 4.11: The infant industry argument

The basic idea is that no economic activities will happen in industries in which there are no possibilities to make positive profits because competition from abroad is currently too strong. A finite protection from international competition can make firms to grow and become more productive so that they can face foreign competition after the protection is abolished. The core of the argument is that infant industries do not have economies of scale like competitors from abroad and, hence, need to be protected until they can attain similar economies of scale.

[Figure 4.11](#) provides a schematic for understanding the infant industry argument. In the left panel you see that the domestic supply curve lies above the world market price, P^W . Thus, the domestic industry is not competitive enough to produce at costs lower than the world market price. A tariff in time t would protect the domestic market so that some firms start to produce and sell their goods at home.

The hope of the government now is that the firms become more productive over time and in turn their supply curve shifts downwards. The downward shifted supply curve in time $t + 1$ is shown in the right panel. Here, the government can remove the tariff without crowding out the domestic production.

Exercise 4.4 — Arguments for trade restrictions

(Solution → p. 93)

Explain briefly (2-3 sentences) the infant industry argument.

Solution to Exercise 4.4 — Arguments for trade restrictions

(Exercise → p. 93)

A finite protection from international competition can make firms to grow and become more productive so that they can face foreign competition after the protection is abolished. The core of the argument is that infant industries do not have economies of scale like competitors from abroad and, hence, need to be protected until they can attain similar economies of scale.

4.8 Gains from trade

[Figure 4.12](#) and [Figure 4.13](#) contain domestic supply and demand curves. In autarky with no possibilities to trade, supply and demand must meet. Under free trade and a given world market price, P^W , countries can trade with each other. This has implications for the producer surplus (yellow area) and the consumer surplus (blue area), as shown in the figures. The area of the triangles a and b as denoted in [Figure 4.13](#) represents the welfare gain from free trade that can be achieved given the world market price, P^W .

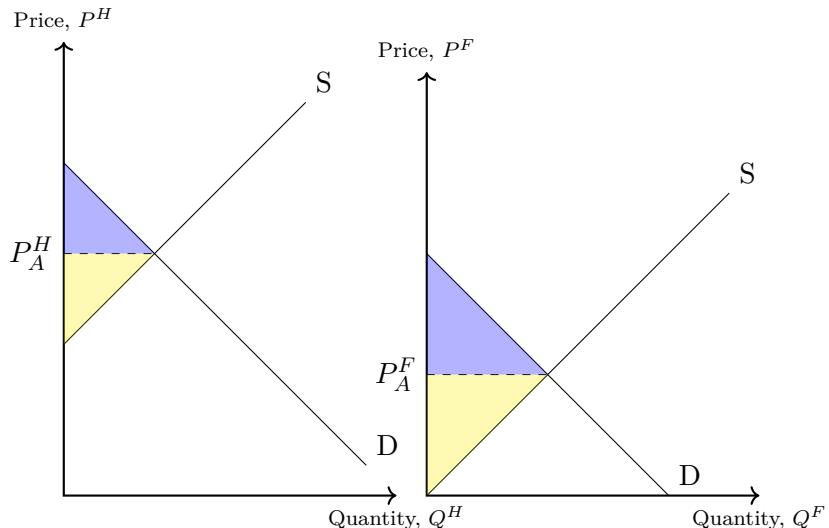


Figure 4.12: Two countries in autarky

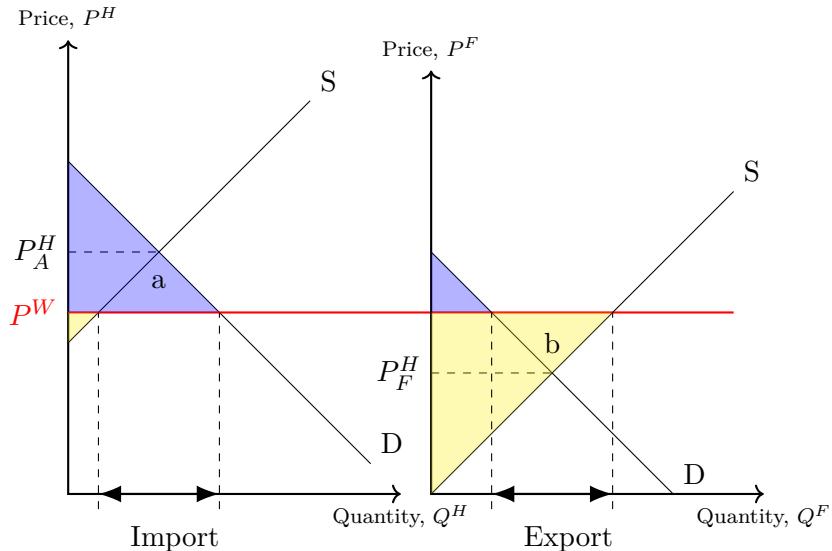


Figure 4.13: Two countries that trade with each other

4.9 Tariffs and quotas in small open economies

Tariff

[Figure 4.14](#) can teach us a lot about the impact of a tariff t on trade and welfare. A tariff raises the domestic price of imported goods. If we assume that the imposition or change of a country's tariff has no effect on the world price, we consider what is called a small open economy, which is so small that the country's consumption and production decisions do not affect the world price. In other words, the country takes the world price for granted because its import demand does not change the world price.

In autarky, the economy represented in [Figure 4.14](#) would consume 5 units at price P^A , and total welfare would be represented by areas $a + b_2 + b_1$. Under free trade without tariffs, the country imports 8 units and consumes 9 units at the price of P^W . The consumer surplus corresponds to areas $a + b_2 + d_1 + c + d_2$ and the producer surplus corresponds to area b_1 . After the introduction of tariff t , the consumer surplus is equal to area a and the producer surplus is equal to area $b_1 + b_2$. Thus, consumer surplus has decreased while producer surplus has increased. The area c is equal to the government's revenue. It represents the portion of the consumer welfare loss that is transferred to the government. Overall, welfare has decreased. The welfare loss is equal to the areas of the two triangles d_1 and d_2 . These triangles represent what is called the *deadweight loss* due to the tariff. Specifically, triangle d_1 represents the reduction in imports that is replaced by domestic production, and triangle d_2 represents the loss in consumption due to a reduction in imports and a reduction in domestic consumption.

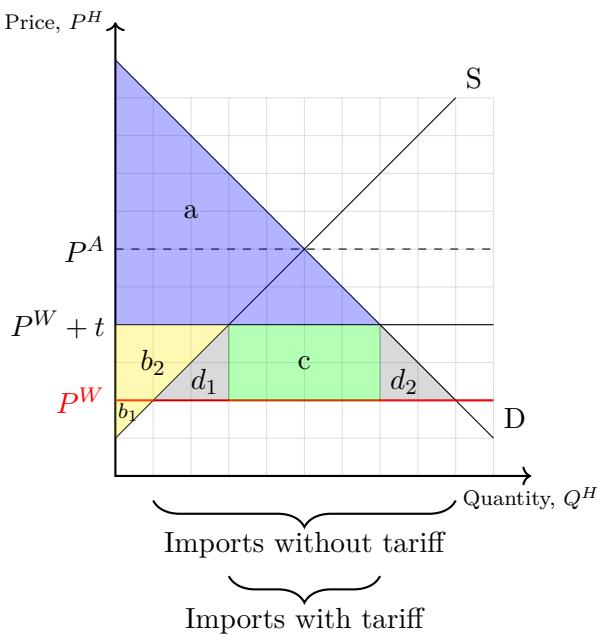


Figure 4.14: Tariff in a small open economy

Eureka 4.1 — The implications of a tariff in a small economy

While a tariff protects domestic producers and increases their surplus, it reduces the surplus of consumers and leads to a deadweight loss of revenue. Overall, a tariff leads to a reduction in a country's welfare.

Import quota

A trade restriction that sets a physical limit on the quantity of a good to be imported is called an import quota. It gives government officials more power and control than a tariff because they can strictly limit the quantity of goods traded and have the administrative authority to grant (or sell) import licenses to certain foreign exporters.

Figure 4.15 shows the impact of an import quota that allows an import quantity of 4 units. In this scenario, 7 units are consumed, four of which are imported. The price at which all seven units are consumed is P^* . This is somewhat surprising because the world price P^W is less than P^* . The reason is that all firms that are allowed to sell their products do so at the highest possible price, i.e., P^* . As above, the blue area is the consumer surplus and the yellow area is the producer surplus. The gray area is the loss in value due to the import rate. The rectangle c is only part of this loss, since we assume that the government does not sell the licenses to the best bidding exporting firm

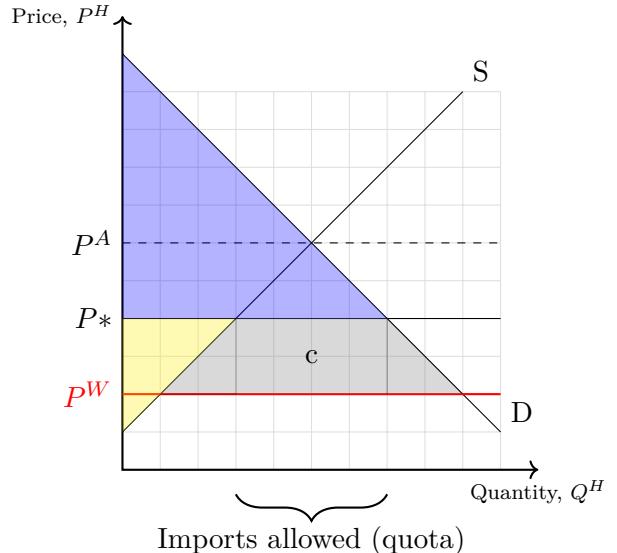


Figure 4.15: Tariff in a small open economy

4.10 Tariffs in large open economies

So far, we have assumed that the country of interest is small and takes the world market price as given. However, large countries' demand for imported goods can have an impact on world prices. If this is

the case, we can show that a tariff can actually improve a country's welfare. Figure 4.16 illustrates the effects of a tariff on welfare, prices, and trade. In particular, we show the impact of a small tariff of 6 euros per bicycle.

Under free trade, the market for bicycle imports is cleared at a price of €300 and the country imports one million bicycles.

Now, if a tariff of €6 per bicycle is imposed, the tariff drives a wedge between the price foreign exporters receive and the price domestic buyers of imports pay. That is, it becomes more expensive for domestic buyers to purchase imported bicycles. This, in turn, leads to an immediate drop in domestic demand for bicycles and pushes the world market price for bicycles to 297 euros. Given the new world market price for bicycles, the domestic price for imported bicycles is 303 euros (297+6).

The consumer surplus is now represented by the blue area and the producer surplus by the yellow area. The green area represents the tariff revenue collected by the government. The two gray triangles, in turn, show the tariff-related deadweight losses. Compared to the free trade scenario, the country gains rectangle c_2 . If the revenue in this area is greater than the deadweight loss, the country has improved its overall welfare by imposing a tariff.

Let us calculate whether this is the case here:

- Area c_2 :

$$(1.58 \text{ million bikes} - 0.62 \text{ million bikes}) \cdot (\text{€}300 - \text{€}297) = \text{€}2.88 \text{ million}$$

- Deadweight loss:

$$\underbrace{\frac{(0.62 \text{ mio b.} - 0.6 \text{ mio b.}) \cdot (\text{€}303 - \text{€}300)}{2}}_{\text{left triangle}} + \underbrace{\frac{(1.6 \text{ mio b.} - 1.58 \text{ mio b.}) \cdot (\text{€}303 - \text{€}300)}{2}}_{\text{right triangle}} = \text{€}0.06 \text{ million}$$

- Indeed, the net gain is 2.82 million Euros. Thus, a small tariff can increase the welfare of a country.

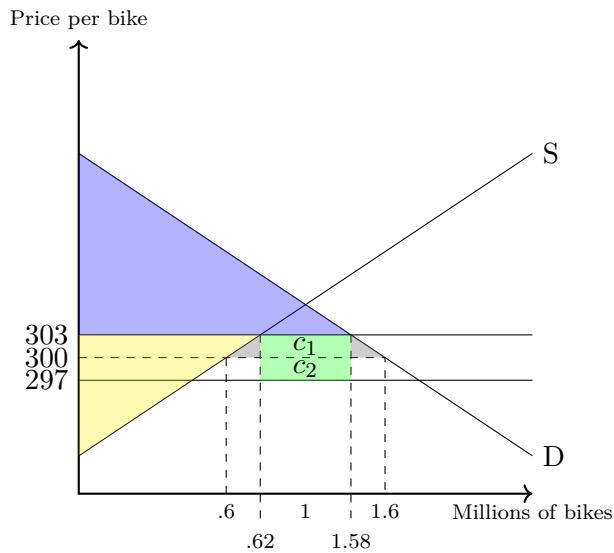


Figure 4.16: The effect of a tariff in a large country

4.11 Other nontariff trade barriers

In addition to tariffs, there are a variety of other trade barriers. These so-called non-tariff barriers (NTBs) include quotas, export subsidies, domestic production subsidies, government buy-at-home policies, and product standards. Here is a more complete list:

- Import quotas
- Voluntary export restraints
- Antidumping laws
- Exchange-rate controls
- Countervailing duties
- Government subsidies
- Licensing, labeling and packaging restrictions
- Quality controls and technical standards
- Domestic-content laws
- Political rhetoric
- Embargoes and sanctions
- Most/least-favored nation status

For example, **product standards** are much more important than you might think. For example, no car from the United States can be sold in the European Union without modifications because our safety standards are different. Another example is the **CE** mark (see below). Harmonization of product standards is usually an important issue in trade agreements.

CE Marking It does not mean ‘China Export’! While **CE** is sometimes indicated as an abbreviation of ‘Conformite Europeenne’ (French for *European Conformity*), it is not defined as such in the relevant legislation. The mark indicates that the product may be sold freely in any part of the European Economic Area, irrespective of its country of origin. The **CE** marking is a declaration by the manufacturer (not by some authority!) that the product complies with EU standards for health, safety and environmental protection for products sold within the European Economic Area (EEA). Thus, it is not a quality indicator or a certification mark and may also be found on products sold outside the EEA. You may also know the *FCC Declaration of Conformity* which is used for selling certain electronic devices in the United States.

Exercise 4.5 — Tariff

(Solution → p. 98)

The government of a large country needs your help to decide whether the introduction of a tariff of \$100 per metric ton of steel is a good idea, or not. At the current world market price of $p^W = \$600$, the country imports 14 millions metric tons of steel. The government expects that a tariff of \$100 per ton of steel would decrease the world market price of steel for \$1.

- (a) Calculate how much the overall welfare gain (or loss) of the country would be in case the government decides to introduce a tariff of \$100 per ton of steel. Assume thereby that the supply curve is given by

$$P^s = 400 + \frac{1}{2}Q^s$$

and the demand curve is given by

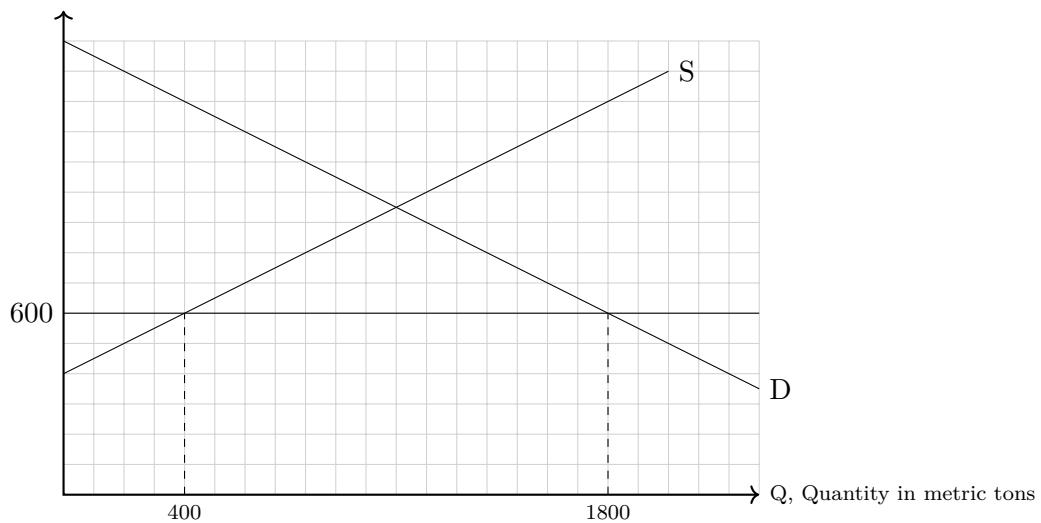
$$P^d = 1500 - \frac{1}{2}Q^d.$$

These curves are also shown in the figure below.

- (b) What would be the tariff so high that it makes an import of steel prohibitively expensive.
 (c) What would be the world market price so low that it makes any domestic production unprofitable.

(d) What would be the world market price so high that the country exports steel.

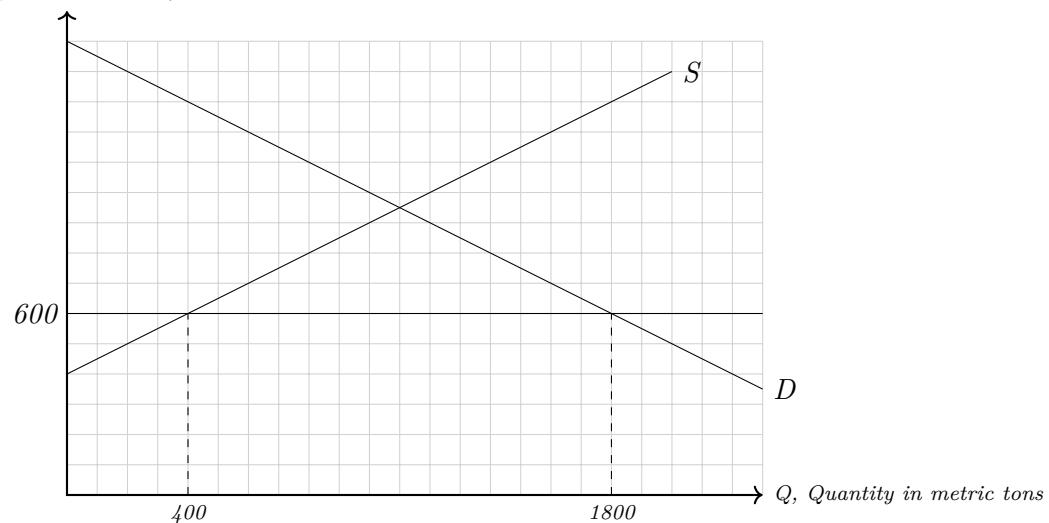
P, Price per metric tons of steel



Solution to Exercise 4.5 — Tariff

(Exercise → p. 97)

P, Price per metric tons of steel



- (a) (By analogy with [Figure 4.16](#), here we should compare the two gray triangles with area c_2 .) The price per metric ton of steel from foreign suppliers will be \$699 because government will charge \$100 on each ton of steel which is now worth \$599 on world markets. As \$699 is still below the autarky price of \$950, domestic suppliers will set prices to be equal to \$699. Thus,

$$699 = 400 + \frac{1}{2}Q^s \Leftrightarrow Q^s = 598$$

$$699 = 1500 - \frac{1}{2}Q^d \Leftrightarrow Q^d = 1602$$

$$1602 - 598 = 1004$$

That means, at a price of \$699 domestic supply is 598 and domestic demand is 1602 tons of steel. 1004 tons will be imported.

To calculate the **welfare loss** (the two triangles), we can calculate the left triangle only and double it (please note that this is only possible if both triangles really have the same size which is only the case if both supply and demand curves have the same slope in absolute

terms!):

$$\underbrace{\left(\underbrace{(598 - 400)}_{\text{loss in quantity}} \cdot \underbrace{\frac{1}{2}}_{\text{to get the triangle}} \cdot \underbrace{(699 - 600)}_{\text{increase in price}} \right)}_{\text{left triangle}} \cdot \underbrace{2}_{\text{right triangle is of same size}} = 9801 \cdot 2 = 19602$$

The welfare gain (the new square that is due to the change in world market price, a.k.a. c_2) is $1004[\text{tons}] \cdot 1 \left[\frac{\$}{\text{tons}} \right] = \1004 . Thus, overall welfare gain is

$$1004 - 19602 = -18598.$$

That means, the welfare loss exceeds the welfare gain by \$18598.

(b)

$$400 + \frac{1}{2}Q = 1500 - \frac{1}{2}Q \Leftrightarrow Q = 1100$$

$$P^s = 400 + \frac{1}{2} \cdot 1100 = 950$$

At a price above \$950, no steel would be imported. Thus, a tariff must be so high that the price of foreign steel within the country exceeds \$950, i.e., $P^W + t > 950$. Assuming that the world market price would have a lower bound of \$599, i.e., any tariff above \$100 would not decrease the world market price any further, than a tariff of $(950-599=351)$ \$351 would make imported steel prohibitively expensive.

- (c) Below a price of \$400 any domestic production would be unprofitable because the supply curve tells us that no domestic producer would be able to supply anything at and below the price of \$400. To proof that just set $Q^s = 0$ in the function of the supply curve and you get $P^s = 400$.
- (d) At a world market price above \$950, it would be profitable to export steel because domestic supply exceeds domestic demand and the world market price is higher than the production costs.

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