Chapter 15: Geography, climate and natural resources

So far we have focused on governmental differences explaining the differences in incomes among countries. In this chapter we will look at other determinants of income; geography, climate and natural resources. Data shows that there are great differences among countries within these determinants of income.

Geography

When one looks at the world population density one sees that people are not equally spread around the world. Around 90% of world's population lives on only 10% of the land.

In some parts of the world population density is very low due to the fact that there are conditions that make it impossible to live there. Most people are found at places where conditions are favourable for production and living. Such favourite characteristics are moderate temperatures, level ground and fertile soil.

Openness to international trade facilitates technology transfers and thus improves productivity. This will lead to an increase in income per capita. One determinant of openness to trade is geography. The geography of a country is unchangeable. This means that some countries have a fundamental advantage over others.

The most important geographic determinant is a country's proximity to the ocean. Ocean transport is the cheapest way to ship goods. Evidence suggests that ocean transport is important in determining where people live and what standard of living they enjoy.

Data suggests that there is a strong positive relationship between the fraction of a region's population living within 60 miles of an ocean or river and the region's average level of GDP per capita.

Another geographic determinant of openness to trade is a country's location with respect to major centres of economic activity. The further away from a developed country, the higher transport costs will be.

Distance to the sea and distance to major economic centres explain the differences on the cost of transporting goods. The average cost of transporting imports is calculated as the average cost as a ratio of the total value of imports. One can detect great differences in these ratios among countries. In the United States this ratio is 4.9% while in sub-Saharan Africa this ratio is 19.5%.

The access to trade does not only explain differences between countries but it can also explain differences within different regions of a country.

If one looks at the world one can see that wealthy countries tend to be near to each other; there is clustering. There are two explanations for this clustering:

1. The clustering reflects countries' influences on their neighbours. Economists call these cross-border effects **spillovers**. Countries that are near to each other are more likely to trade with each other.

   Some wealthy countries make their components in neighbour countries with low wages. An example of such a thing is the **maquiladora** assembly plants in Mexico. These plants import components from the United States and ship their output back over the border.
2. A second explanation is that nearby countries share common characteristics that may be important for growth. Nearby countries have for instance the same climate.

Geography also effects economic growth through its effect on size of states and the conduct of government. There are differences in the formation of states among different parts of the world. The formation of states in Europe differs a lot in comparison to most of the rest of the world.

In many parts of the world there was remarkable centralization while in Europe there was a lack of unification. One expects that a unified country will have a larger market and productive ideas would spread more easily across the states. This should lead to higher economic growth.

On the contrast, disunity raises the change of war between neighbouring states which leads to a waste of resources. In the preindustrial period Europe lacked unification and therefore experienced such wars between states.

Despite these disadvantages of disunity, historical experience points out that Europe experienced economic growth in this period. There were several constraints on the government that forced Europe's monarchs to be less prone to wasteful extravagance compared to China.

Historical record seems to show that the virtues of competition apply to countries. Europe experienced outside competition in neighbouring countries where innovators could go to. In China there was usually no outside competition for the government to worry about.

Many economists argue that Europe's fragmental political structure comes from its geography. Europe is divided into several parts by natural barriers like mountains and bodies of water. Even though these parts separated by nature can still trade and communicate with each other it is very difficult to govern as a single unit.

Climate

A very important aspect of a country's geography is its climate. The **climate** is defined as the seasonal patterns of temperature, precipitation, winds and cloud cover.

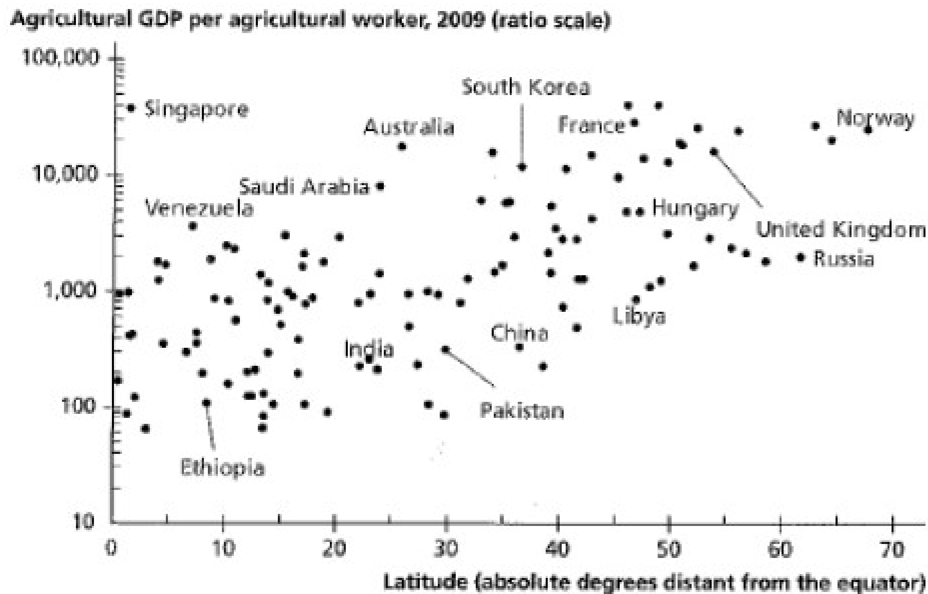
Before, we noted that there is a strong relationship between distance to the equator and income per capita. Since latitude is linked to climate we can see that climate plays a role in determining income per capita.

However, climate does not depend on latitude alone. It also depends on distance from the ocean, weather systems and altitude.

Geographers divided the earth into 12 climate zones. The largest part of the earth has a snowy-forest climate with dry winter. However, this is not the place where most of the population lives because living circumstances are not favourable there. The most of the population lives in mild humid climate with no dry season.

In the tropical regions we find a population that is relatively poor. The wealthiest parts of the world are generally in the temperate region. This group contains 34.9% of world's population and has an income per capita that is 1.94 times the world average.

Climate affects the economy by making a location more or less pleasant as a place to live. Climate has an effect on productivity, especially in the agriculture sector.
The graph below shows the relationship between a country's latitude and the production per agricultural worker.



Historical evidence shows that differences in agricultural productivity among countries affect income per capita. The output per worker in the agriculture sector differs greatly between temperate and tropical regions. The output per worker in tropical areas is relatively low.

Tropical areas have longer growing seasons than temperate areas. However, tropical areas suffer more from several disadvantages in producing useful products. The rain pattern in the tropics is not optimal for farming. Long periods of rain are followed by long dry seasons. This leads to a lower output per worker in the agriculture sector in tropical areas.

We noted that there is a strong positive relationship between health and income per capita. Richer people can afford to buy better inputs into health. But these differences in health can also come from the health of the environment. Differences in this health environment among countries can result in differences in both health and income per capita.

Countries with better health environments will have workers that are healthier and are this able to produce more output. This will improve medical care and thus improve health further.

Tropical areas have a bad health environment. In these areas there are many diseases that are harmful to humans. Such diseases are malaria, yellow fever, sleeping sickness. This high concentration of diseases is a result of two things:

1. In some tropical regions it never freezes which lead to a wider selection of parasites and disease-caring insects.
2. Local parasites had many time to evolve.

Before 1945 malaria was found in many parts of the world but nowadays it is almost exclusive to the tropics. Malaria restrictions are probably a result of the poverty in the tropics. These countries in the tropics may be too poor to undertake proper preventive measures.

The **malaria ecology index** measures the susceptibility of a country's climate to mosquito breeding and the prevalence of mosquito species that feed only on humans.

The **incidence of malaria** is the fraction of the population that was exposed to the risk of malaria in 1994.
Historical evidence shows that the ecology index and the incidence are closely related to each other. In countries with a low ecology index, little or none of the population was at risk of getting the disease.

Climate also affects economic growth through its effect on human effort. Montesquieu (1748), argued that people are more vigorous in cold climates. People in warm climates cannot work

hard because they will overheat. Three-quarters of the energy of a worker's muscles takes the form of heat.

Natural humans are more vulnerable to exposure during winters in the temperate zone than to overheating in the tropics. Technological progress helps people to deal with these problems. We are able to warm ourselves with clothes and we are able to cool ourselves with air conditioning.

However, cooling technology (air condition) is much less portable than heating technology. Air condition is relatively high and therefore we see this more in developed countries than in poor countries in the tropics. So air conditioning has so far very little impact on worker productivity in the tropics.

Natural resources

Another very important geographic determinant of income is the presence of natural resources. Natural resources such as farm-land, forests and minerals are important in producing output.

It seems obvious that countries with more natural resources should be richer. However, this relationship seems to be more complex than one would think.

Before the 19th century, fertile land was the most important natural resource for determining economic growth. Land was more significant than capital as a factor of production before industrialization. Growth of many countries in that time was very much resource driven.

To investigate the role of natural resource in determining a country's income we use World Bank measures of a country's natural capital. **Natural capital** is the value of a country's agricultural lands, pasture lands, forests and subsoil resources, including metals, minerals, coal, oil and natural gas.

Natural capital represents the resources that exist irrespective of human activities. Natural capital and GDP per capita are positively related. Countries that have more natural resources tend to have higher income per capita. However, there are many exceptions. Japan and South Korea are very resource poor countries but have very high income per capita.

Even though there is a positive relationship between natural resources and income, this relation is weak. The effect of natural resource on income is limited. Countries with low resource available can grow rapidly and countries with many resources can grow slowly.

Booms in income resulting from natural resources often tend to be temporary. Discovery of a new resource will lead to an immediate increase in income but eventually the resource runs out.

An explanation for the weak relationship between natural resources and income is that natural resources are easy to transport across country borders. A country with low natural resources available can import resources from abroad leading to economic growth. The government of a country plays an important role in making resources effective for economic growth.

The amount of natural resources available in each country tells us nothing about whether the resources available to the world as a whole will affect global economic growth.