

THE RELATIONSHIP OF ECONOMY, TRANSPORT AND SOCIAL DEVELOPMENT – PRESENCE AND HISTORY

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The paper observes the mutual relationships of the economy – i.e. the natural need of people to barter goods - and the transport and the following impacts of these linkages on the development of society and area complexes. This is shown partly by the historical contexts of the development of medieval Prague to the present form along with the analyses of present statistical data concerning particularly the national economy, environment and life quality.

The economy with high level of division of labour would not be productive enough without efficient transport systems. However, they require increasing transport capacity and have impact on the environment and power supply. It is a proved fact, that countries with more liberal economy are economically stronger (the relation between the index of economic freedom and the gross domestic product). But the question is, what are the consequences for other human activities and whether in the transportation we can use the so called Kuznets curve, which predicates that the environmental impacts decrease with the increasing wealth.

Key words: economy, environment, energy, relation, transportation, history

1 Introduction

The close relationship between transport and economy can be demonstrated during the centuries of human existence by many examples. The transport is on of the basic elements of the trade and the trade (i.e. barter of goods) is besides the natural resources or human capital the next source of the wealth of societies, what follows on the simple law of comparative advantages.

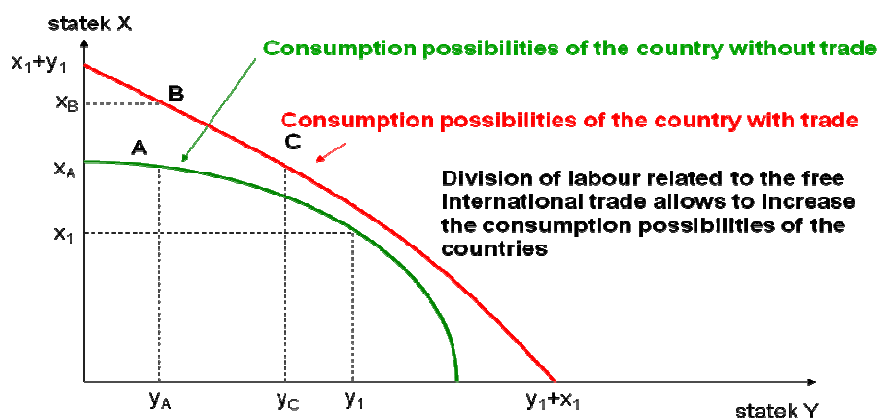


Fig. 1: Principle of comparative advantages. Source: [1]

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The figure shows how countries can move from one consumption possibilities curve to another one (from the green to the red one), when they use the bilateral trade and so they utilize from the division of labour. This principle helped in the past many countries to the wealth and it has still been helping (what is of course true not only for the national economies, but for individuals or firms). So China could enjoy prosperity at the time of existence of the Silk trail as well as the states around the Mediterranean Sea that could use the maritime transport for their trade. The railway connecting the east with the west of the USA fastened the colonisation of the area. Today this mutual dependence is also large and it has been used by still more countries since the time of the industrial revolution, that made possible to build the infrastructure essentially independently of natural disposals.

2 Transport and the development of sites

The economy and consequently the transport system do not influence only the economy efficiency that we got used to represent as the aggregate indicator of the GDP in the 20th century, but also the structure of city sites. It can be very nicely demonstrated by the example of Prague, where the development can be divided into four basic periods:

- the first period between the 10th and the 14th century, distinguished by evolutionary processes, in this period first ways and settlements in the today's Lesser Town and Old Town
- second period, started by the building of the New Town, connecting the Vyšehrad castle and the Old Town and finished by the impact of first effects of the industrial revolution
- third period, when in the second half of the 19th century the city begins to grow, the walls were teared down and first systems of public transport rose in Prague
- fourth period, beginning in the sixties of the 20th century, characteristic by the mass development of the individual car transport, that Prague has been conforming to with big problems.

2.1 First period - evolutionary

So the trade and the transport have been belonging since the very beginnings of the modern human society to the main factors that determined and have been determining the shape of city organisation and the location of cities on the whole. The Old Town Square used to be during the era of the Premyslid dynasty an important market place, a crossing of long-distance ways and the “Ungelt” was situated in his close neighbourhood – then a princely custom house. As the authors Emanuel Poche a Josef Janáček mention in their book „Through Prague step by step” [2]:

„It seems that just here, close to the trade and production centres, it is necessary to look for the origin of that permanent habitation, from which Prague developed, and that both castles, Hradčany and Vyšehrad, originated for their protection and security. Then the Prague castle “Hradčany”, thanks to the political consciousness and aggressiveness of their masters, Czech princes of the Premyslid dynasty, developed in the second half of the 9th century to the most important place not only in the Czech clan, but also in the whole country and overshadowed the Vyšehrad castle, that got under control of the Premyslides and became their minor seat.

Clearly somewhere here we can find what we call the genetic code of a settlement today. If we again let speak both authors - Emanuel Poche a Josef Janáček, we learn more. When we are listening to the story about the origin of new settlements along the ways, it also reminds the present reflections about the so called multiplicative effect of transport infrastructure:

„By the main ways from the market place to both castles and in their neighbourhood a number of smaller Czech settlements originated, marked by small parish churches. They are the settlements Podskalí, Opatovice, Zderaz, Rybníček, Bojiště, Psáře on the right bank and Obora, Nebovidy, Újezd on the left one, as well as the core of the self castle surroundings in the today's Sněmovní street with three small churches.

2.2 Second period started by the building of the new town

Prague then experienced a few stages of stormy development. The rise of the Old Town, further of the Lesser Town and above all the foundation of the New Town by Charles the 4th that was unique in its time above all for its wide streets further three natural centres of trade originated: the Horse, Cattle and Hay market squares. The construction of the New Town was probably inspired by Jerusalem, that emperor Charles thought to be the centre of the Christian world, Prague should enjoy a similar position within Europe.

The construction of the New Town was a broadminded project. It was necessary to connect three main squares by today's streets Jindřišská and Vodičkova, as well the New Town with the Old one by today's streets Spálená a Jungmannova. As a document of the Charles' inspiration by the Jerusalem, the couple of streets Ječná and Štěpánská are mentioned, led in a similar way like in Jerusalem.

We have already mentioned the genetic code of a city, the Prague's one comes clearly from the period between the 10th and 14th century. At this time there is the ground of the city, its communication networks and centres of trade (today's squares). Today it is very difficult to imagine that time and the shape of former Prague. But the key message is, no matter whether it was the evolution or well-considered human design, the city was in both cases formed by the needs of trade and hence of transport - first there was a way, connecting the castle and the market place and only then settlements and market places grew up around it (today's important Prague squares) and their connection played a key role during the construction of the New Town in the 14th century.

2.3 Prague and industrial revolution

The industrial revolution brings at the beginning of the 19th century vast changes in the organization of the society that will incorporate into the city shape by a fatal way after some tenths of wears. It is typical for the industrial revolution, that cities become centres of human life. The first manufactories come up there and the life moves from the villages to cities, where the population grows. The agricultural character of the society changes gradually to the industrial one.

The principle of the industrial revolution, consisting of the higher use of the division of labour, was already described in the second half of the 18th century by the Scottish economist Adam Smith (1723 – 1790) in the book *Inquiry on the nature and origin of the wealth of nations* (1st edition on the 9th March 1776) [6]. The division of labour increases the output of the economy, so the higher is the degree of the division of labour, the more is the need of a high efficient transport system. This is why during the Medieval Ages countries with access to sea were richer, because they could use for the trade the then dominating naval transport. That is why Adam Smith was opponent of all state interventions, limiting the free trade among states.

The naval transport was the forming element for the origin of towns that rose on big rivers, where trade transport took place. So important cities are located on large rivers. The industrial revolution induced by the higher city population the increased need for transport as well as it made possible to build transport infrastructure independent of natural conditions – the railways came up first and as for towns, what we today call urban mass transport started to develop. At the same time the industrial revolution caused by the origin of manufactories a big transfer of people to towns for the jobs. This and the entering

of the railway to Prague increased the need for the urban mass transport – i.e. regular transport regardless of the momental passenger demand. First state-coaches, then horse-driven tramways and finally one of the greatest discoveries of the industrial revolution – electricity – comes up. So the first electric tramway in Prague started to operate on the 18th July 1891, on the occasion of the Land jubilee exhibition and its goal was the transport of the visitors from Letná to the exhibition area.

The industrial revolution had also another impacts on the life in Prague. One of the most fundamental was the demolition of the Prague city walls, restraining the new conditions. This action had started in 1874 and was continuing till the begin of the 20th century. So Prague could grow unmolested and pick up other city quarters (Královský Vyšehrad, Holešovice, Královské Vinohrady, Libeň, Dejvice a.o.).

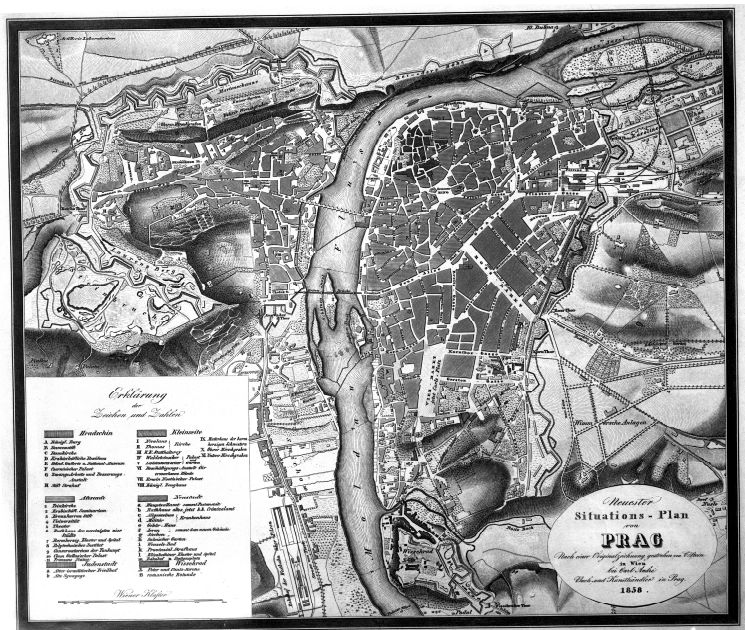


Fig. 2: Map of Prague from 1858 shows the capital still bound by walls, but already with the railway going to today's Masaryk station. But the changing economic and technological conditions changed this state soon in a cardinal way.

2.4 The development of individual car transport

When at the end of the 19th century the mass transport was developing successfully (before the origin of the Electric companies of the royal capital city of Prague they were exclusively business activities), the beginning of the 20th century brought another phenomenon – the individual transport. The higher possibilities of mass production together with the new energy source of oil (although the first commercial well was accomplished 1859 in Pennsylvania) led to broader availability of cars for the public.

Of course at the moment when the cars started to substitute the former ways of transport nobody thought about the problems that the individual transport can bring in the future, initially the praise even concentrated to the decrease of horse excrements in the towns.

As late as the sixties of the 20th century and the first flicker of the massive development of the car transport were an alarming signal. The individual car transport became slowly a serious rival of the public transport and one realised as well, that Prague (above all the Old Town and the Lesser Town) with many

narrow lanes was not built for the mass car transport. In addition, Prague was influenced negatively by the construction of the north-south arterial, that goes through the city centre and isolates from the historic centre two important buildings – the National museum and the Main railway station.

That came out fully in the nineties, when another radical lifestyle change came, with the private car as a natural part. And here comes to light fully the problem of Prague, if you like its historical centre, that can't absorb the increasing traffic.

3 Economic freedom, GDP and transport

By the example of Prague we wanted to show the closure of the economy (of the natural human need to barter) and of the transport during the whole history of the mankind and how this has been influencing the society significantly. The possibility to barter free is also one of factors influencing the so called index of economic freedom (IEF), published by the Heritage Foundation. This index comprises i.a. especially the freedom of trade, but also the range of the state sector or the observance of the human rights. It results explicitly from the various data compared with the GDP of respective countries, that the greater is the economic freedom, the higher is also the gross domestic product of the countries.

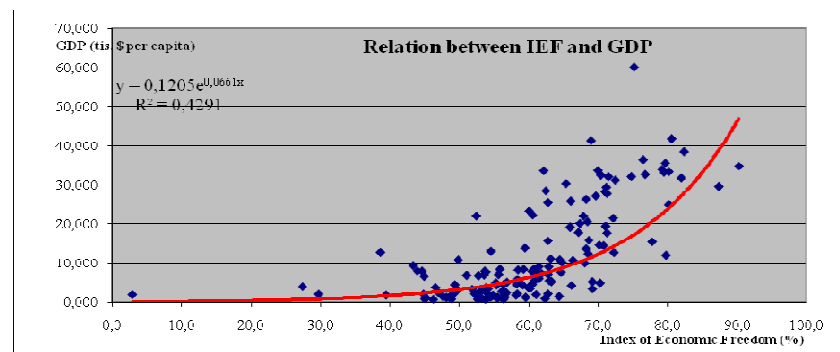


Fig. 3: The relation between the index of economic freedom and the gross domestic product

Source: www.heritagefoundation.com, Czech Statistical Office

The higher GDP needs greater economic freedom. And probably this always used to be so in the history. Another problem is how the economic growth influences other parameters, mainly the environment. As for the transport, it is especially interesting to follow up the relation of the GDP and the development of the individual motoring that has the largest environmental impacts. By the comparison of the particular countries we find:

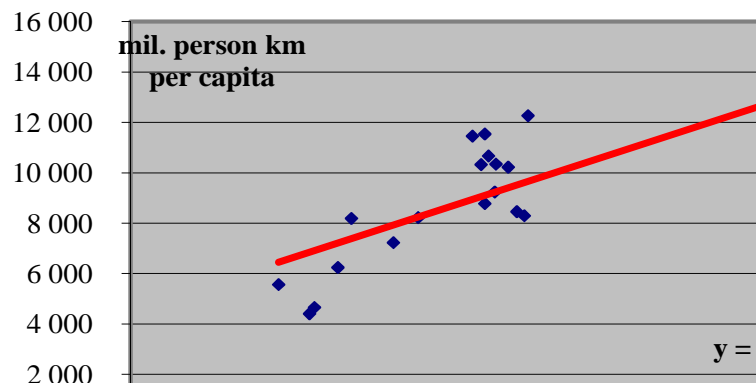


Fig. 4: The relation between the GDP per capita and the individual car transport output of the European countries. Source: Yearbooks of Transport [3]

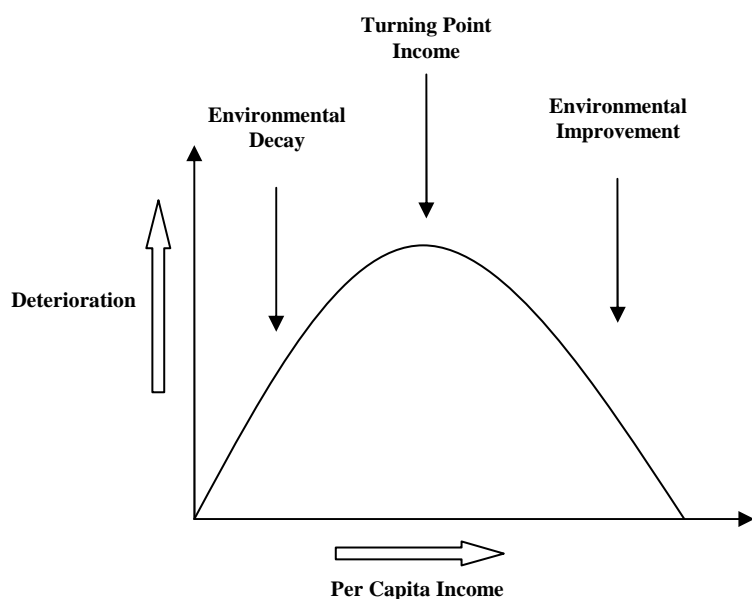
The graph shows that the higher is the GDP, the larger is also the output of the individual car transport, it is interesting the points mostly left belong to the Czech Republic, Poland, Hungary and Slovakia. On the contrary, the point mostly right represents Luxembourg. So we come to the paradox that the economic freedom leads to the growth of the level of living, but it can have larger impacts on the environment. But does that really hold true? In fact the 20th century brought the crucial question, whether the impacts of human activities on the environment are so serious, that it is necessary to control them by some way. If we consider only the transport, there are at least two evident reasons to make control:

- the ecologic reason – the impacts of transportation on the environment and the human health are continually higher, above all in cities, this is the reason for the higher transport regulation
- the energetic reason – the problems with oil resources and their geographic distribution and above all the security of oil (or natural gas) supply from the countries with less or more dictator regimes lead to the need to seek for new possibilities of car propulsion

The mankind has never been resolving such situation (we do not want to claim, that the mankind did not resolve lots of problems and challenges in its history, only the character of this situation is another). On the one hand the level of living increased markedly in the more advanced (simply said the north one) part of the world, what has surely many reasons, however one of them is the human possibility to use the energy from fossil fuels. But it has impacts on the environment (apart from the greenhouse effect and the global warming like about demonstrable local impacts of the transport on the environment and the human health in cities) and moreover the fossil fuels are exhaustible resources.

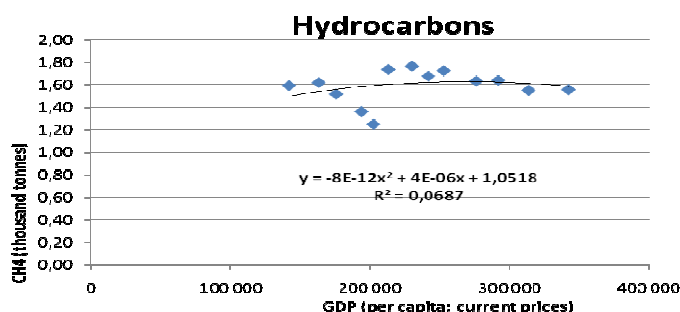
4 Emissions from transport and the GDP

The fact often left out in the problems of emissions is the so called Kuznets curve. Simon Kuznets is American economist of Russian origin, who was interested in the measuring of the GDP and its relationships to other quantities. The Kuznets curve tells that the higher is the GDP, the smaller are the social differences (we can see it in the developed states with the strong middle class - many people earn the average wage level).

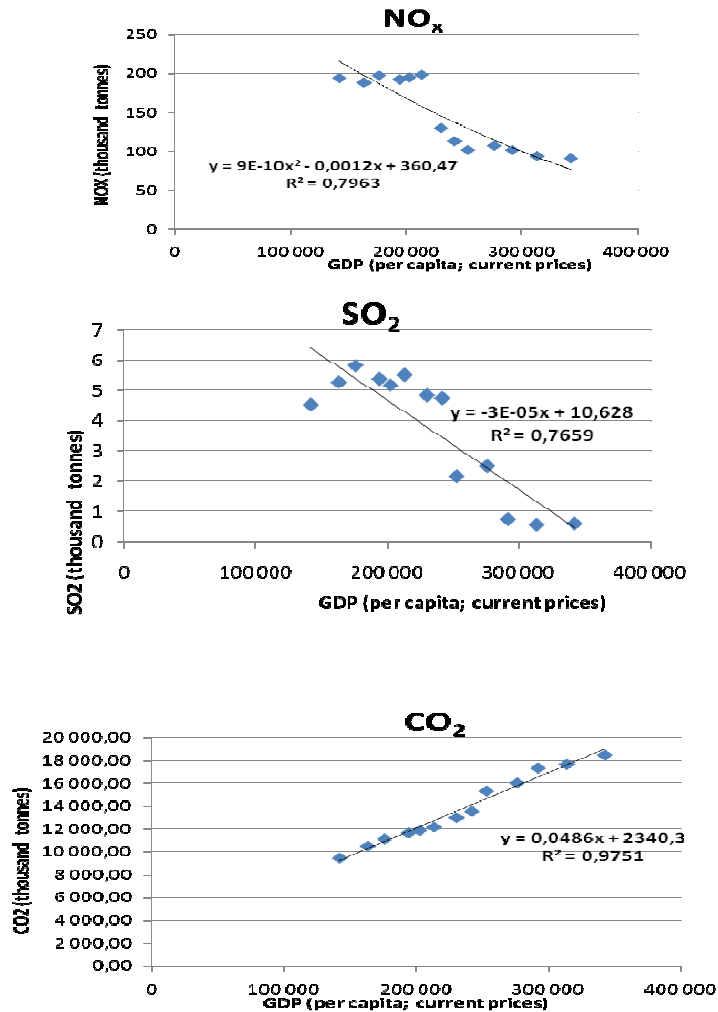


The derived environmental Kuznets curve (EKC) is not any more his own work, but the construction of the economists Grossman and Krueger. It shows that with the increasing wealth of a country, measured by the GDP, the environment also improves, because for the countries it is profitable to use cleaner technologies only after gaining some level of living¹. Its shape is as follows:

The history of the Czech Republic is not so long yet for us to make far-going conclusions. Nevertheless we can try at the end of this paper to show the relation of the emission from transport on the GDP amount (in current prices), what is included in the following graphs, where the carbon dioxide, nitrogen oxides, sulphur dioxide and hydrocarbons were chosen as emission examples.



¹ Against this statement the logical objection holds, that countries after gaining certain wealth transfer the production to less developed countries with cheaper labour force. Hence with the production transfer the related emissions are also transferred. But this proposition is not interesting for our research, because we are concerned with the transportation and its outputs can not be transferred elsewhere, they always take place in the given country.



The performed analysis shows that the Kuznets environmental curve holds true for some types of emissions from transport in the Czech Republic. Definitely we can say, that it is not true for the emissions of the carbon dioxide, that have been growing dizzily. But its impacts are still controversial and so it is surprising, that many regulations still relate to this type of emissions. It is of course questionable, whether the Kuznets curve must hold true exactly for this type of emissions. The amount of CO₂ emissions is given by the macroeconomic formula [5]:

$$CO_2 = POP \cdot h \cdot en \cdot eCO_2, \text{ where}$$

CO₂ amount of carbon dioxide emissions [mass unit/year]

POP population [person]

h GDP per capita [money unit/person.year]

en energy intensity of the economy [energy unit/money unit]

eCO₂ amount of CO₂ emissions to the unit of energy carrier (carbon intensity)
 [mass unit/energy unit]

So far as the carbon dioxide emissions from transport should be lowered, probably the only way to this is the decrease of the amount of CO₂ emissions to the unit of the energy carrier, in the transport

practice it means to cut the fuel consumption. The arguable question is of course the harmfulness of the carbon dioxide.

5 Conclusion

Whatever the reasons be – ecological, energetic or geopolitical, the mankind is probably near an outstanding change that new technologies can bring. The aim of this paper was to show at least in a shortened form the role of the transport in the mankind development, its influence is important above all on the economy and the generation of the national wealth. As the best example we can mention the industrial revolution, that by supplying unthought-of production possibilities forced at the same time the higher efficiency of the transport system (as for the transport means, transport infrastructure or the use of other energy resources). The performed analysis shows, that ecological reasons need not necessarily be the ones, that should lead to higher regulation of transport.

The transport system and its function will be closely associated with the possibilities of the energy system, that were mentioned in this paper only marginally. The development of this system will depend on some circumstances:

- whether it will be accomplished to exploit before now not easy accessible oil and gas reserves
- whether the alternatives to the conventional propulsions of transport means will be economically comparable and will dispose the sufficient infrastructure
- whether it will be managed to diversify the necessary resources for the electricity supply, for this energy form appears to be essential for the sustainable development of the transport system.

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