

**Tim Phillips [00:00:00]:**

Today on VoxTalks Economics. Did history's scholars foster growth? Welcome to another VoxTalk, recorded live at the Center for Economic Policy Research, Paris Symposium 2023. My name is Tim Phillips. In the 21st century, we assume that improving human capital creates economic growth. But can we make a link between pre modern scholars and GDP per capita? And if so, what is that link? David de la Croix of UC Louvain is one of the authors. The other one is Matthew Curtis of a paper that traces the impact of eight centuries of scholarship in Europe, and he joins me now. Welcome back to Voxtalk's Economics, David.

**David de la Croix [00:00:59]:**

Hello, Tim.

**Tim Phillips [00:01:00]:**

This is a remarkable piece of research. Which scholars are you including in your research? What dates are they from, and where did you find their names?

**David de la Croix [00:01:11]:**

We try to start from a relatively well defined universe of scholars by taking all the people that were at some point between the year 1000 and the year 1800, either teaching at universities or members of some scientific academy. And this everywhere in Europe or in Latin Europe, I mean, excluding the muslim part and the Byzantine parts, the data comes not from archive material because that would be too much work, because there are about 200 universities over that period and about 200 academies of some renowned also. So going in the archives there would imply maybe supervising 400 PhD thesis in history. But hopefully there has been a lot of work that has been done by historians themselves, based on archives, writing books about the history of academies or the history of universities, often even books on the biographies of their professors. And so the source of this database, it's about 500 books from the secondary literature, and all is done manually. So it's manual encoding of everything. We started six years ago, and there are now 60,000 scholars in the database.

**Tim Phillips [00:02:26]:**

Congratulations on getting to this point. But to make that association with GDP, you have to associate scholars with places. So what assumptions do you make to do this?

**David de la Croix [00:02:39]:**

So, we have three types of places that we encode: the place of birth, which is usually known in maybe 70% of the cases. Sometimes it's an approximate place of birth. I don't have the birth certificate of everyone, if you see what I mean. Then we record the place of activity, which means the university or the academy to which they belonged. It could be multiple academies or universities, because they could change over time. And the third place we record is a death place when it's available. So we don't record the place where they studied because that would be unavailable in many cases.

**Tim Phillips [00:03:21]:**

For most of the period that you study the creation of knowledge, it was a very elite occupation. Most people couldn't even read so should we be measuring the knowledge that was created, or should we be measuring how widely distributed and understood that knowledge was, which would be something more similar to what we would do with recent knowledge creation and innovation?

**David de la Croix [00:03:44]:**

The paper is really about knowledge production. So we are talking here about very elite knowledge, at least. So in the medieval period and in the Renaissance, so that knowledge is created by universities, and we are talking essentially about theology, law, medicine, arts and humanities, including some science. And so this knowledge was spread to the society through specific channels and sometimes probably unexpected channels. So I have an example I just saw last week at a conference on the anniversary of my own university in Louvain. So it's the example of theology. So, for example, they had a debate in the 16th century about what is a just price, and those are theologians, and we are talking about scholastic theology. So it's a high level logical reasoning. But then that will be taught to the people that will become priests a little bit everywhere. And for those priests in the catholic regions, they will confess citizens, and it's through that channel that they can apply what they have learned about the just price when they confess, a merchant that is asking whether he should sell that stuff where and how and so on. So you see, it's that kind of trickle down.

**Tim Phillips [00:04:56]:**

You also have to measure the productivity of these scholars. And there are no journals, there are no citations, there's no Google scholar at this time. So how do you measure their productivity?

**David de la Croix [00:05:05]:**

We rely on a web system called Worldcat identities, which in fact, I should say was based because it's now over. But the word about that in a minute. So WorldCat identities is a union of library catalogues which has arranged the books by authors so you can look for a specific author. The Worldcat will tell you all the books or other things they have in their collections that are available for you to see in the world. And so we can count the number of publications per person, which is the thing we are interested in. Of course, it's seen today because it's the libraries today, some stuff has been lost, et cetera. But I think this is more noise than other things. No, unfortunately, Worldcat identities has shut down suddenly. So if we want to expand the study we made with the new data that is coming every day in that database, we will have to rely on another system, which might be the VIAF catalogue, which is a bit the same idea as Worldcat, but a bit different.

**Tim Phillips [00:06:17]:**

When you're investigating the effect of this knowledge generation, your measure of output is income per capita, in 1900, which seems very late to me, because that's after the industrial

revolution, it's after the spread of capitalism. Why didn't you take a measure earlier?

**David de la Croix [00:06:36]:**

The answer to that question, I think, should start by stressing the benefit of my database, which is the European scope. So we really cover all of Europe, I used to say, from Evora in Portugal to Polotsk in the east of what is Belarus today. And so finding outcomes at the European level, that's not at all easy. So I think before 1800, the only thing which was widely available was the city size. And cities are indeed a proxy of wealth in a malthusian context. But here we are interested in the takeoff to modern growth. So we will control for city size in 1800, so for development in 1800. And then the earliest measure we have for income later on is this database of GDP per nuts, two level in Europe. So regional GDP, which we can use, but it starts only in 1900. But I think that's fine, because in 1900, of course, the first countries have taken off, but there are still some discrepancies within countries, and also some countries were really lagging behind, especially in 1900.

**Tim Phillips [00:07:45]:**

The big question now is what is that overall relationship? What's the relationship between scholarship during the period you study and GDP in 1900?

**David de la Croix [00:07:55]:**

We find a positive correlation between the number of scholars weighted by their publications in the past. So I repeat, between 1000 and 1800 and GDP in 1900. So that correlation is much stronger. If we group scholars by region of birth, if we group them by region of activity, the effect is still there, but it's divided by two. So we are happy to see a correlation between human capital and income, as any growth model would predict, in fact. But still, we may wonder about what is the mechanisms, because the effect of a scholar like, let's say, the effect of Copernicus, it should be a global effect on the whole of Europe. No, it should not be a local effect around where he was born or where he lived. In fact, at first sight, it looks natural to have this correlation, but then it's a bit surprising when you think a bit more, and then you may wonder why birthplace and not activity places which would be where the universities or the academies are located.

**Tim Phillips [00:08:58]:**

One of the things you do for this is to refine this. You group them by their subjects, don't you? The subjects that they were active in, they don't really correspond, the things that scholars studied in those days, to what we would consider to be subjects. Now, how did you do that?

**David de la Croix [00:09:14]:**

We really wanted to put them in groups or to classify them based on what they wrote. Because from my secondary resources. I know that that guy taught, for example, theology here, but then he may become a well known astronomer in Paris, and so is he theology or astronomer? So what we did is again to use Worldcat, which was nice enough to provide topics for each of the persons in their database under the form of a cloud of words. So the exact methodology that

they follow to build this cloud is not totally clear, but we used it, and each word has a kind of importance given by the size of the letters that we see on the screen. So using these words, we can get a list of a bit more than 1000 topics. And so we would like to assign to each person a unique field based on those topics. We use a method called k-means clustering, which is a way of putting the scholars together by minimizing the distance between them, topic wise, within a cluster. If we do that, we can also get an optimal number of clusters according to some criterion we choose. So we obtain ten clusters, so ten fields, and in a sense what we obtain is not very surprising, which I think is good. We have two theology fields. They look a bit like Catholicism and Protestantism, but it's not exactly that. One would be more about the church and the other more about the Bible. Then we get law, politics, medicine, science altogether. Botany is on the side, philosophy, and then another cluster like classics. It's the biggest cluster, it's a big people we cannot rank elsewhere. What I would like to stress here, when you look at who is in those clusters, it's really that all these fields have roots in the Middle Ages and even far back, hence the title of the paper, seeds of knowledge. So it's really the first seeds. So I can give many examples. But for example, in mathematics you have a Sacrobosco, a relatively well known professor of the University of Paris, around 1200, who wrote a lot of math books and using hindu arabic numerals that were started to be spread in Europe at that time.

**Tim Phillips [00:11:30]:**

So once you've done that and you've got these clusters, which ones are driving GDP growth?

**David de la Croix [00:11:35]:**

If you consider the cross country differences, which means that in the regression you do not have country fixed effect, you just regress the GDP per capita of a region on the different shares of the different fields. So law and theology appear important, and theology the second theology. So more like the protestant theology, which echoes may be a little bit weberian thesis according to which protestant countries develop faster. So that's something we find so law has a negative effect in explaining cross country differences. Maybe you can come back to that.

**Tim Phillips [00:12:09]:**

Absolutely. We got to come back to that.

**David de la Croix [00:12:12]:**

And then when we control for countries, when we introduce country fixed effect, so law on theology, their statistical significance disappears. But there remains science and botany, which is really what we expect. But we are so happy to find that science and botany were both important, or at least were both highly correlated with regional GDP and explaining differences within countries across their different regions.

**Tim Phillips [00:12:38]:**

David, the lawyers listening to this are saying, that is absolutely not what we expected. We expected that law would be positive. You're saying there's a neutral relationship. Why is that so?

**David de la Croix [00:12:49]:**

So law, I see two ways to address that question. One is to refer a bit to the development literature today, where some people say, there are too many lawyers, we need more engineers. So that's one thing. So those lawyers are rent seekers and so on. So that's one possibility. Another one has to do with the distinction between a common law and civil law, because, in fact, civil law is taught in universities, and hence we observe many lawyers actually teaching, while common law is not taught at university or not much. It's more in like practical schools in London, not in Oxford and Cambridge. And so those persons, I don't have them in my data, where I have a lot of law research, it's in civil law countries. And so it might capture the distinction between civil law and common law.

**Tim Phillips [00:13:33]:**

We don't acquire knowledge at a smooth rate through time. There must be some period, the obvious one is the scientific revolution, that would have a particular influence, I would guess. Am I right?

**David de la Croix [00:13:47]:**

Yes, sure. So for the moment, we don't do any dynamical analysis, like a panel analysis, because, again, we would need an outcome in the past that we can observe at different points in time. But maybe one day, if we are very creative, we can find something. You observe much more scholars, of course, during the scientific revolutions. And the weight of the different fields is also changing. So theology is declining, maybe not during the reformation, because there was a need to convince the others that either the Catholics or the Protestant were right. But then you see a rise of medicine, a rise of botany, while science was kind of a bit steady over the time period we consider.

**Tim Phillips [00:14:33]:**

This is a fascinating detective story. But put this all together, all these different things that you found out, what do you think is the mechanism by which scholarship is associated with growth in the same place?

**David de la Croix [00:14:47]:**

Yes. In particular, the fact that it's really the birthplace which seemed to matter.

**Tim Phillips [00:14:52]:**

Yeah.

**David de la Croix [00:14:52]:**

So there we then hypothesize a role effect mechanism. If you are born in a village where very important person was also born there and became a famous physician, let's say, and when you have to do occupational choice, like, shall I go to the army? Shall I be a merchant? Shall I study? Shall I become a physician? It could play a role to push people to go into the direction of more human capital. We did some tests of this idea, showing that, for example, the scholars

who migrated away, who left their country, they have less importance than those who stay. And we also looked at some anecdotal evidence. One which I find interesting is Pierre de Fermat. He's a well known french mathematician who was in an academy in Paris. He also worked in Toulouse as a judge. But he was born in a very small village, Beaumont-de-Lomagne, 3000 inhabitants today. And so when you see today, he has a street name in his small village. The tourist office is in the house of Pierre de Fermat, which is 16th century, I forgot to say that. And then once a year, they organized a weekend of mathematics around Pierre de Fermat, to give the taste of mathematics to kids. That's the kind of things I imagine. So I have also another example in mind, which could play in that way. Some famous lawyer who become a pope. Then he wanted to help his poor region of origin, and then he built schools there. So that could also be one of the mechanisms that plays there.

**Tim Phillips [00:16:33]:**

Normally, when I'm asking people questions on historical research, I'm saying, oh, yes, but 20 or 30 years have passed, a lot of things have changed. We're talking about 800 years, 900 years passing. Could it have been that some places have better institutions, some places are more politically stable, for example, and that would cause growth later, but it would also mean better human capital accumulation in the meantime.

**David de la Croix [00:17:00]:**

So our first answer to this question is that we control for economic development in 1800. So in principle, everything which we do not take into account, but also affects economic development in the premodern period is controlled for. Now, probably more generally, you are asking whether there is some unobserved variable which might affect both human capital and GDP, 1900, and that we do not take into account. Or in other terms, you are asking whether human capital is really exogenous. So of course it is not. So, In many growth models that I know, human capital and income per person are both endogenous and evolve over time, say, hand in hand. Hence the correlation we find. So the correlation we find could be just a consequence of that view of the world. Now, we can still try to address this endogeneity question more in depth, and that's not yet in the working version of the paper. It's new. So we could exploit forced migration patterns. And one which is quite telling is when the eastern roman empire fell, many greek scholars around 1450 migrated to Italy. So Italy was the closest place where they could arrive by boat. So they would settle there. And so historians would say they were quite important for the Renaissance in Italy, bringing some ancient knowledge that was a bit lost in the west. If you do that, if you use this migration as an instrument, we find that in the places where those Byzantine scholars arrived, there will be more birth of scholars in the future, and hence more GDP in 1900. So that would be a way to address a little bit this question on endogeneity. There are also two other historical episodes we can try to exploit. One is, of course, that's well known, the migration of the French Protestant, the Huguenots, when the tolerance towards Protestantism was stopped in France in 1685, but also, and that is perhaps less well known, the migration of English Catholics after the reformation into the continent.

**Tim Phillips [00:19:11]:**

This is a fascinating story, and it sounds like it's not over yet. Good luck in your research. Continuing research.

**David de la Croix [00:19:18]:**

Thanks, Tim. Thank you very much.

**Tim Phillips [00:19:23]:**

So read this paper. It is called Seeds of Knowledge: Premodern Scholarship, Academic Fields, and European Growth. And the authors are Matthew Curtis and David de la Croix. It is discussion paper 18321 at CEPR.

**[Voiceover] [00:19:47]:**

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