

# Global warming before global warming

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(joint research project with Jaume Garcia and Xavier Tafunell)

**ESCI-UPF**

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# Recent publications and publications in the making

- with Veronica Binda and Xavier Tafunell, “Spanish Business Performance in the Twentieth Century”, in Y.Cassis, A.Colli & H.Schröter, eds., The Performance of European Business in the Twentieth Century, Oxford University Press, 2016, pp. 136-150.
- “Els historiadors i les grans crisis econòmiques”, Revista Econòmica de Catalunya, 75, 2017, pp. 22-35. Translated into Spanish as “Los historiadores y las grandes crisis”, Revista de 3CONOMI4, 14, 2017, pp. 11-24.
- with Andreu Mas-Colell and Ivan Planas, Turbulències i tribulacions. Els anys de les retallades, Edicions 62, Barcelona, 2018, 345 pp.
- with Xavier Tafunell, Del Imperio a la globalización. Historia económica de la España contemporánea, Crítica, Barcelona, 2018, 511 pp. English version just published (today!) at Palgrave Macmillan, 2021.
- L’economia catalana: una visió plurisecular. Discurs de recepció com a membre numerari de la Secció de Filosofia i Ciències Socials, llegit el dia 10 de desembre de 2019. Resposta d’Andreu Mas-Colell, membre emèrit de la Secció de Filosofia i Ciències Socials. Institut d’Estudis Catalans, Barcelona, 2019.
- « Typologies of industrialization: lessons from Spain », Revue française d'histoire économique, 2019/1-2, N° 11-12, pp. 82-119.

# ...to display potential common research interests

- “Alternatives de política econòmica sense sobirania monetària. El cas de Catalunya”, in vv.aa., Homenatge al professor i col·lega Jacint Ros Hombravella amb motiu dels seus vuitanta-quatre anys i mig, Societat Catalana d'Economia, Consejo General de Economistas i Col·legi d'Economistes de Catalunya, Barcelona, 2019, pp. 166-179.
- “Presentación”, in Jordi Nadal con la colaboración de Carles Sudrià, La Hispano-Suiza. Esplendor y ruina de una empresa legendaria, Pasado & Presente, Barcelona, 2020, pp. 13-40.
- with Xavier Tafunell, « Los ciclos de la economía española », Papeles de Economía Española, 165, 2020, pp. 71-98.

## In progress:

- “Lombardy in a comparative European perspective. A note”, in Silvia Conca, ed., Lombardy economy in the nineteenth century, Routledge, forthcoming
- “Business History in Europe. A survey”, to be published in Revista de Historia Industrial.
- “The making and unmaking of Spanish hegemony”, in Patrick O'Brien and Peer Vries, eds., The Secrets of Hegemony, forthcoming, Palgrave Macmillan
- with Anna M. Aubanell, “Historical Forerunners in Spanish Policy Analysis”, in Laura Chaqués and Jacint Jordana, eds., Policy Analysis in Spain, Policy Press, forthcoming

# Global warming before global warming

(a former joint research project with  
Jaume Garcia and Xavier Tafunell)

## MAIN ISSUES

Why global warming has arrived two centuries after the Industrial Revolution, and not earlier?

Why some of the periods of fastest economic (GDP) growth worldwide have not been of global warming?

Do agglomeration effects matter? Do scale effects matter?

# Global warming before global warming: expected contributions

- This research project resorts systematically to world (and regional) GDP to address these questions.
- It will be the first time GDP will be used on this issue with series predating 1960 (back to 1820 and with a regional breakdown).
- We intend to attribute, with greater precision than the one we currently have, global temperature change to natural forcings and to anthropogenic forcings and the reasons and factors explaining the usually underexplained delay in sensing global warming.

# The reasons behind the first IPCCs

World climate change academic community research has been focused, for years, to convince world authorities of the very existence of global warming, and that it was caused by human activity. They stressed the high speed of global warming and its negative consequences for all humankind.

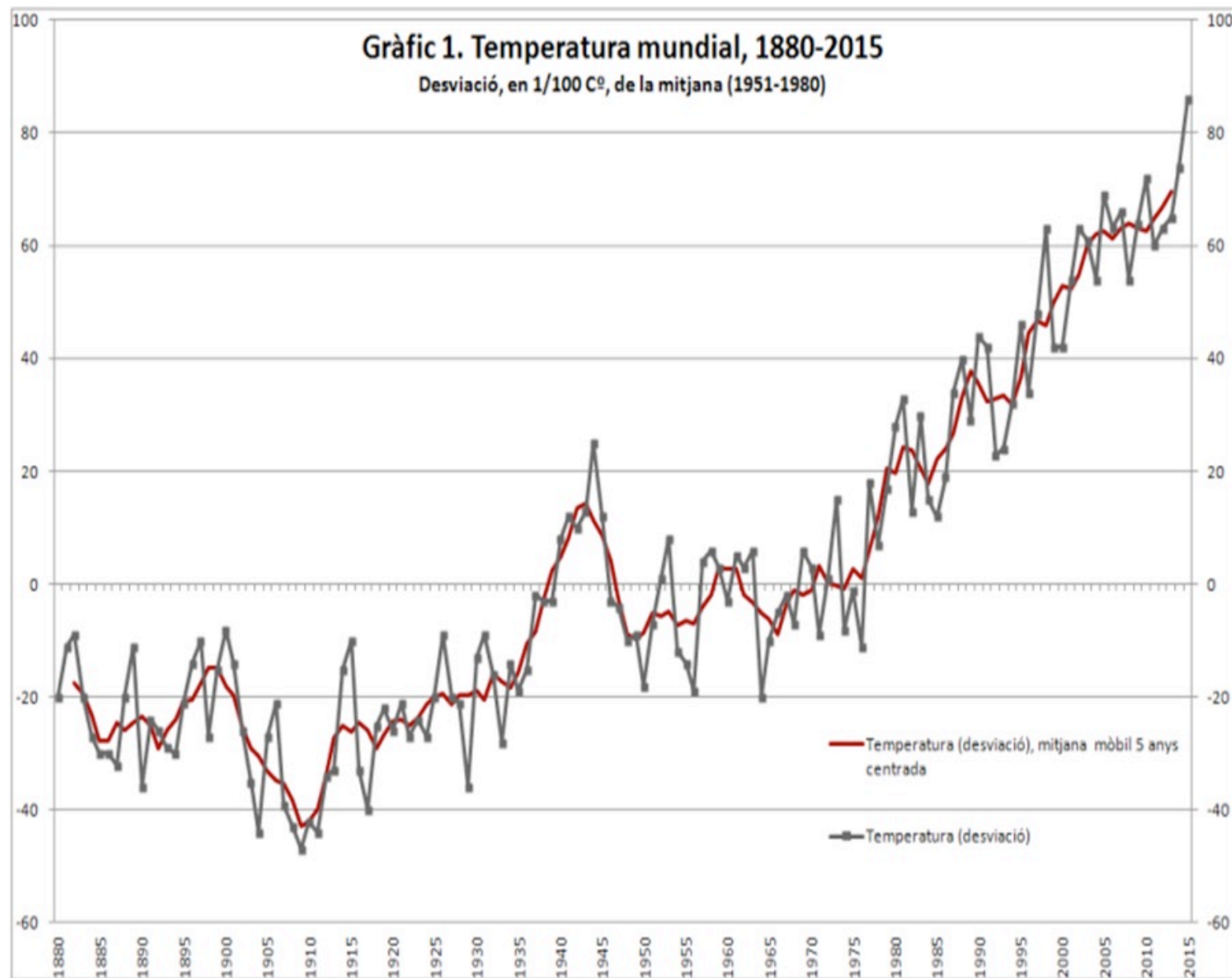
To demonstrate global warming existence and its human activity origin was the core content of the first three IPCCs (Intergovernmental Panel on Climate Change): 1992, 1995 and 2001. After enormous collective efforts, both the existence and the anthropogenic origin were well established. It was not easy nor straightforward as global warming was detected prior to its measurable emergence. Before 1980 there were no external signs of global warming.

# Twentieth century evidence of global warming

- Indeed, global warming, measured as a temperature above the millennial average (and for a long time, above 1900-1930 average) only appears by 1910. For some thirty years, to 1940 or a bit later, global temperature will rise. But, since early 1940s to 1975 or a bit later, global temperature goes slightly down and it even returns to pre 1910 levels.
- From 1980 onwards the increase of temperature is out of discussion. By 1988, when IPCC is created, this “out of discussion” character had to be confirmed. Each new IPCC report confirmed the trend. By 2001 it became out of discussion for the whole scientific community and for the educated elites.

# Gràfic 1. Temperatura mundial, 1880-2015

Desviació, en 1/100 Cº, de la mitjana (1951-1980)



# Confirming human action responsibility

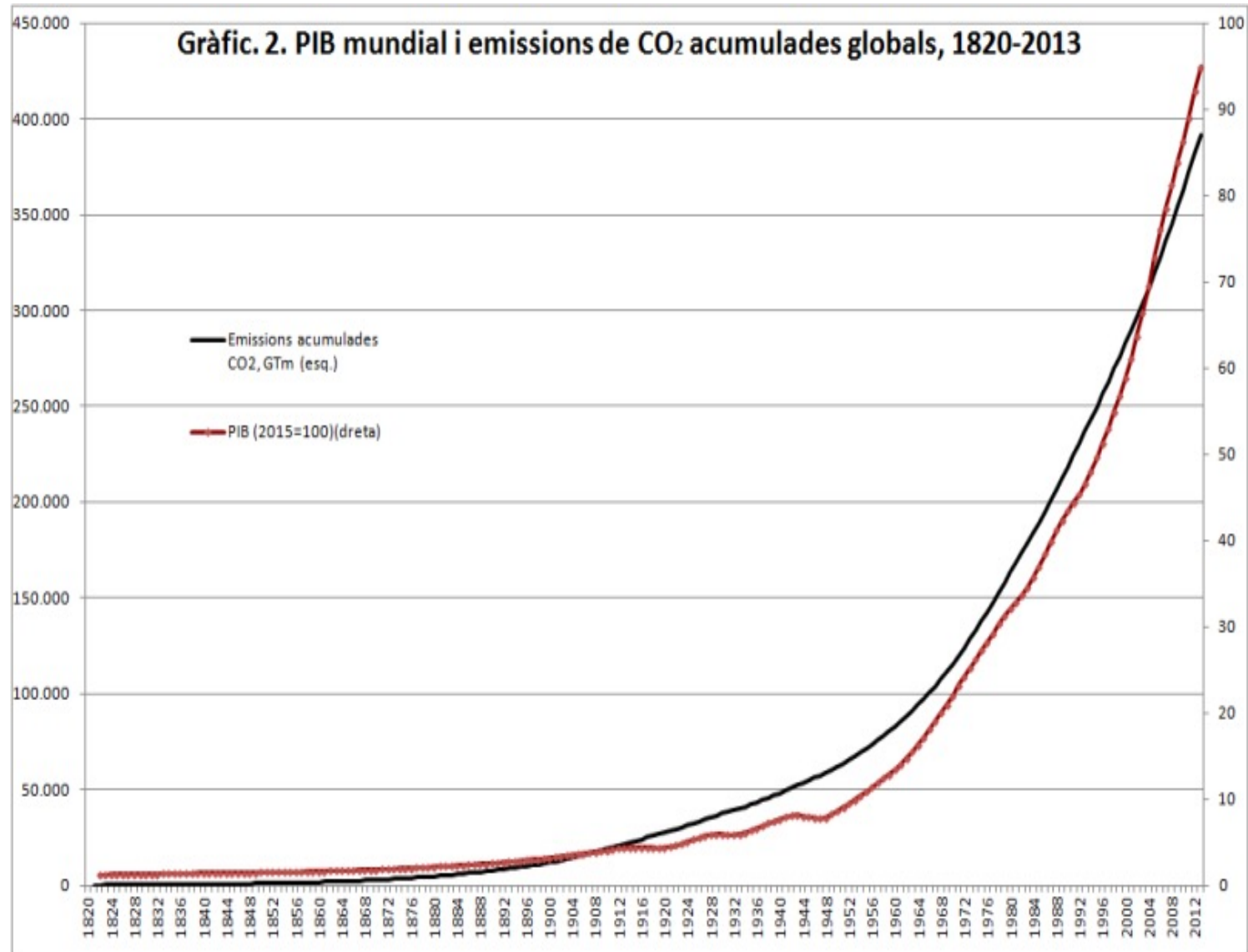
- The **second** goal –to prove incontrovertibly to political authorities that human action was responsible for global warming- was harder. Much more research was needed, and it only was fully accepted with the fourth IPCC report (2007), even if it was crystal clear since IPCC 2001, when attribution models allowed to assign how much variation in global temperature since 1880 was responsibility of natural factors and what of human action.
- It was enough to make the case that humankind was responsible, but not enough to understand why global warming did not start earlier than when it did.

# The new focus: developing mitigating tools

- Once the scientific community was freed from the weight of having to convince world authorities that global warming existed and that it was human action responsibility, it could switch with renewed energy to model temperature behaviour, to explain its determinants in order to properly forecast future evolution and, above all, to propose global warming mitigating actions.
- Climate change scientists start to attract the attention and collaboration of other disciplines interested in designing technologies and policies of global warming mitigation. The economists, specially since the Stern report, gained quite a leadership in the design of policies to slow down global warming. Engineers became the leaders in developing mitigating technologies.
- The focus on new technologies and policies left aside some relevant elements of the research path followed earlier on to assess the causes of global warming.
- We plan to start our research action at this precise scientific juncture.

# Putting GDP out, CO<sub>2</sub> in

- The demonstration of human responsibility on global warming was mostly based on data on greenhouse emissions, mainly, but not only, CO<sub>2</sub> –carbon dioxide. Given the paucity of long term reliable historical series on the most compact index of the human activity accepted by the academic and the international community –GDP-, GDP was put aside. There were good official world GDP series only starting in 1950.
- Given the fact that temperature variation could be well documented starting in 1880, and even a bit earlier, and given the link to CO<sub>2</sub> emissions, as a consequence of industrialization and its massive resource to fossil fuels (initially coal), the lack of GDP historical series provided an incentive to focus on the emission of the main greenhouse gases.

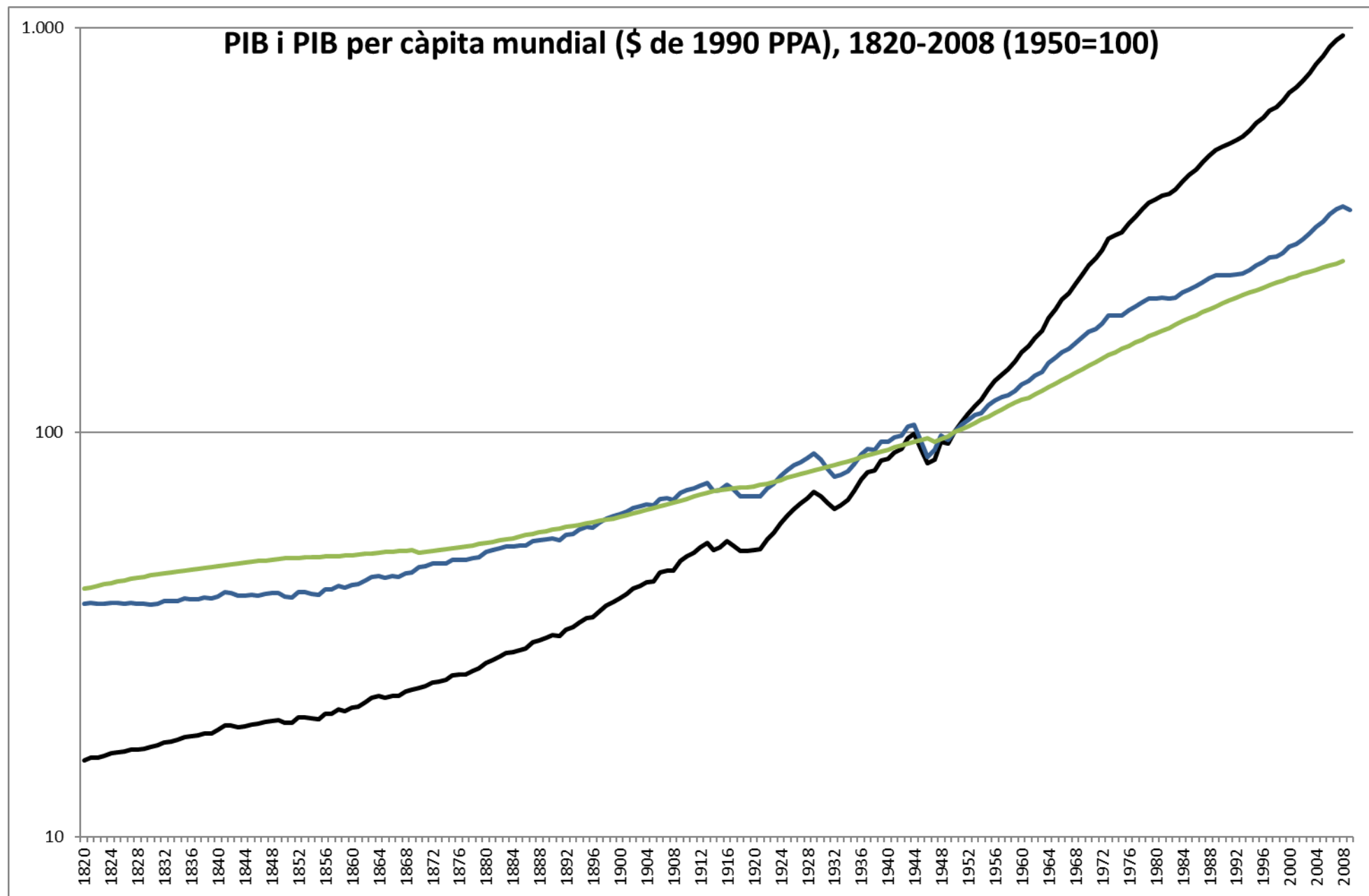


# Praise of GDP in climate change research

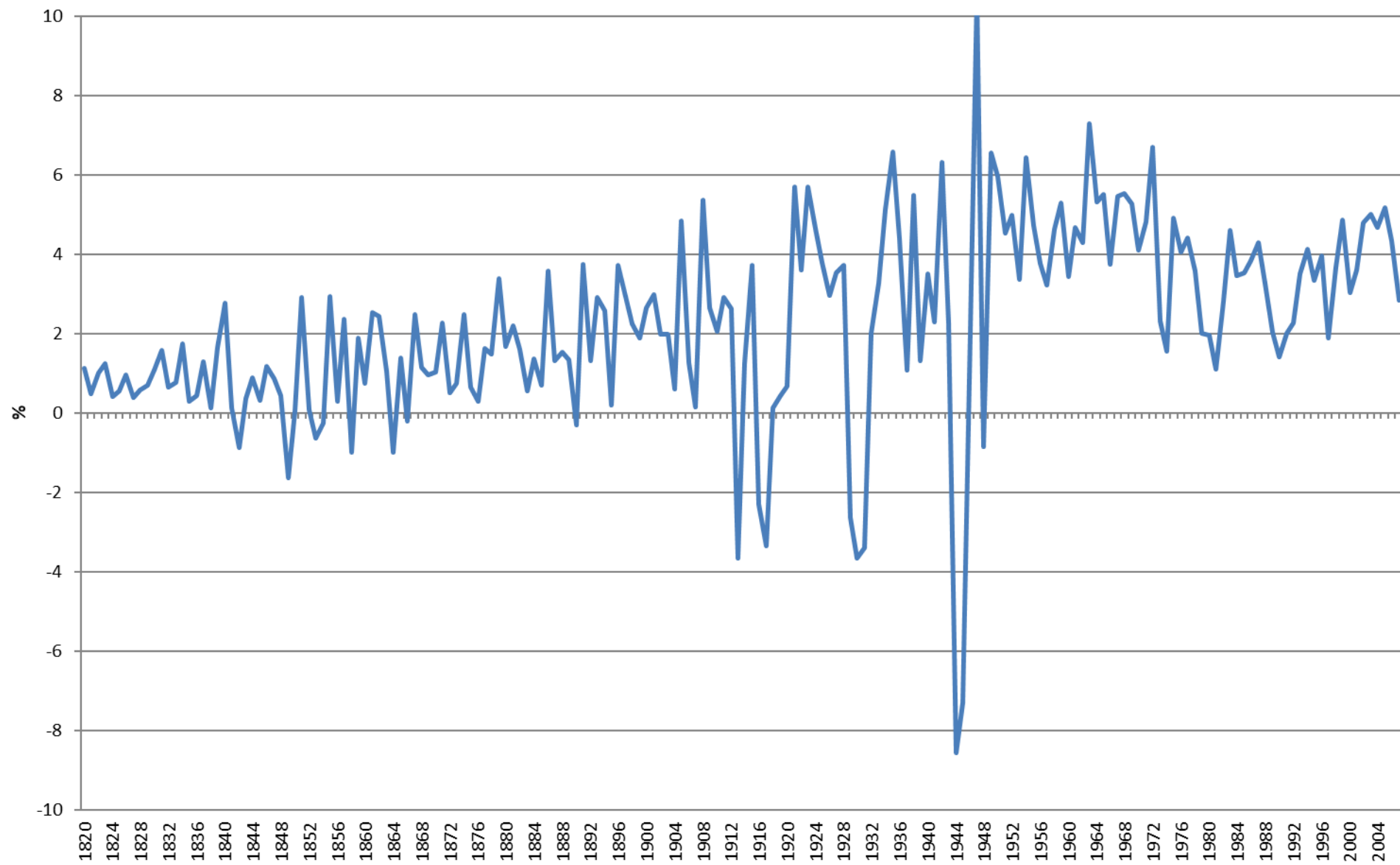
- GDP has many virtues as a shortcut good quality index of human activity. It measures the value added of all the activities that could be economically measured. It does not provide, for sure, a good measure of human welfare but of the volume of goods and services manmade. It does not include goods and services with unknown price, but it covers whatever good and service with a market reference.
- This makes GDP a poor index of welfare but is quite ideal as proxy of humankind productive activity. It does not exclude other indicators, but it is generally accepted by the United Nations and by all the international and academic communities. Of course, it would be necessary to go deeper on how much GDP evolution differ from CO<sub>2</sub> and other greenhouse gases.

# A much richer GDP historical database

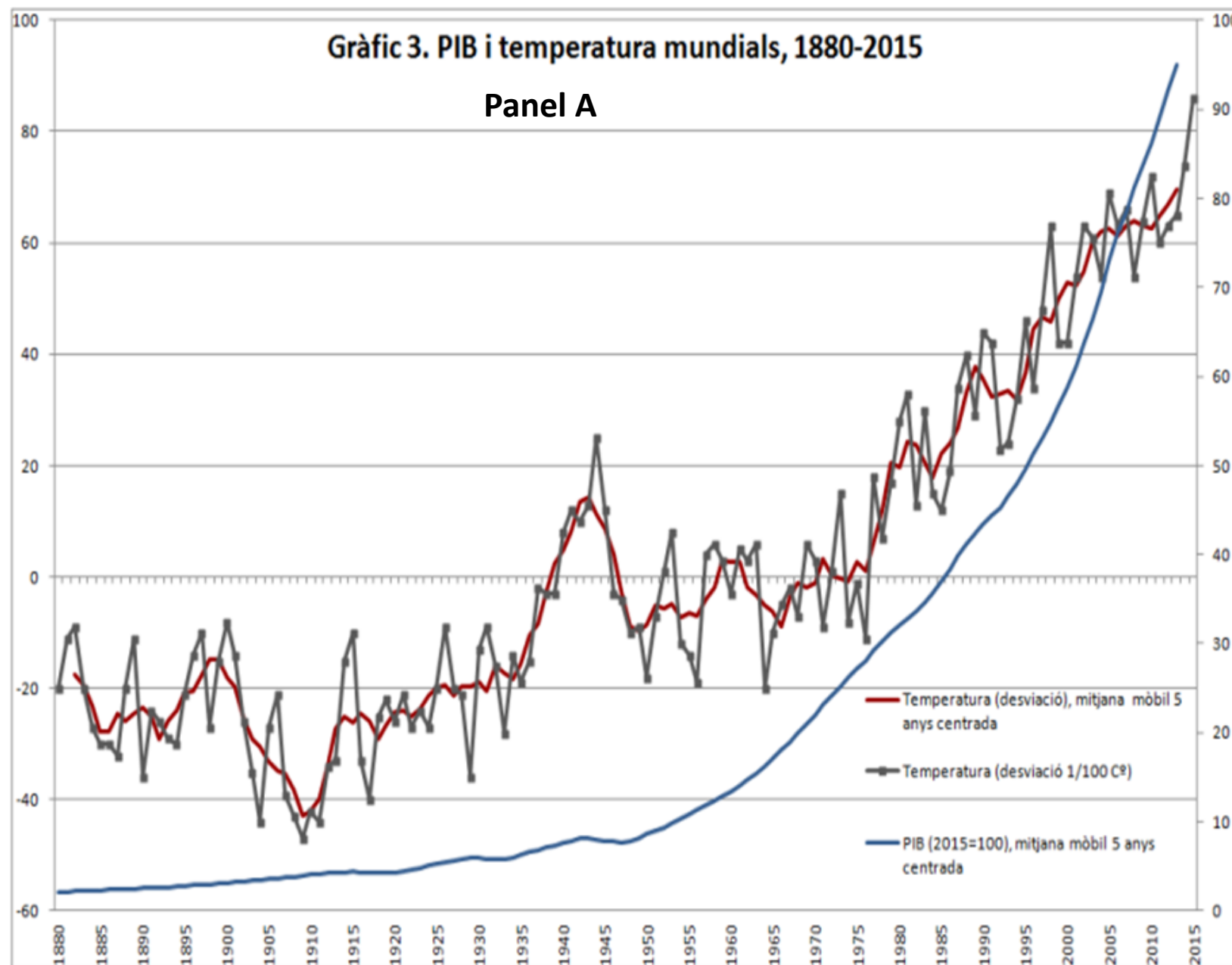
- We go a step further taking advantage of the extensive GDP historical database, created by generations of scholars, mostly economic historians.
- We include estimates for China, not included earlier on, and estimated values for the periods with some critical shortage of data, as it happens with some countries during some World War years.
- With all of this we build a new long term world GDP series to recalibrate the models of climate change and global warming.



## Taxes de variació interanual del PIB mundial, 1820-2008

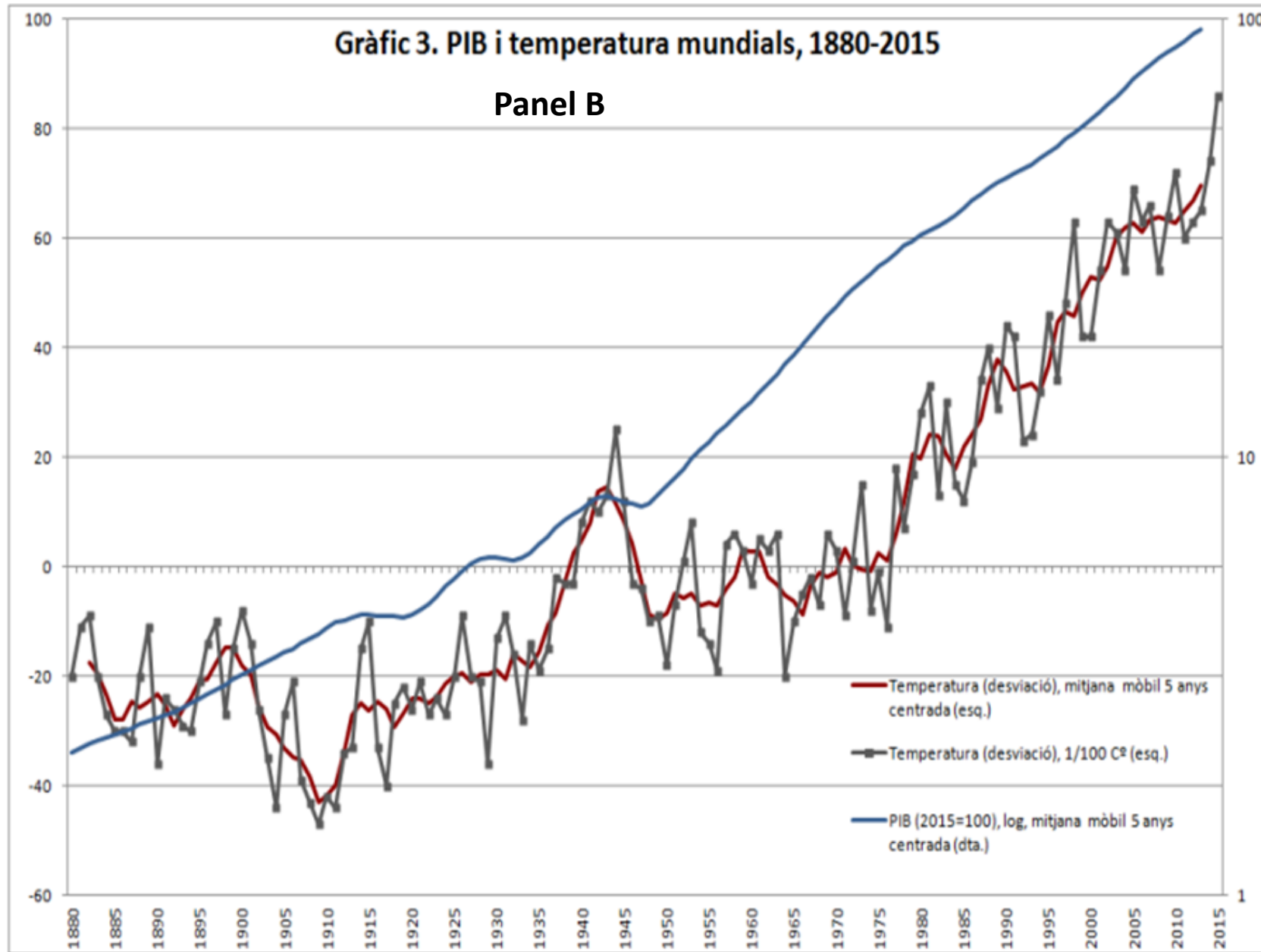


The sense of urgency comes from the contrast between a global warming series like the one besides and world GDP evolution along the same period. If global warming is the outcome of human action, there are three paradoxes to be solved.



# First paradox

- World GDP starts to grow above its traditional levels much earlier than first temperature series. Population growth and improvement of life standards are a fact in Great Britain since sometime in the eighteenth century. They are a non reversible movement by 1820. As we have a world GDP per capita series starting in 1820 we can state that we count on the relevant GDP series to measure industrialization diffusion all over the world (Western Europe and the United States).
- On the other side, temperature does not change until circa 1910 when industrialization is more than one century old outside Great Britain and one and a half century in Great Britain.
- What happens? We should assume –pending fact checking- that CO<sub>2</sub> emission volumes are not enough, until circa 1910, to alter global temperature at the Earth surface. We do not know precisely if this is so because of natural cooling or because the CO<sub>2</sub> absorptive capacity of seas and forests, the big natural CO<sub>2</sub> deposits.



## Second paradox.

When temperature starts to go up for some 35 years (from 1910 to 1945) it coincides with the economic deceleration period better studied in modern economic history: First World War, the shaky recovery of the 1920s, the Great Depression of the 1930s and Second World War.

These are not big growth years but three major stagnation periods. But global warming does clearly appear. How is it possible? Why could it happen? Are the known human causes and the known natural causes enough to explain the paradox? Are we missing any major explanatory factor?

# Third paradox

- The biggest of all paradoxes, but perhaps the most important to solve the mystery, is the behaviour of global temperature between, circa 1945 and 1975. These are the thirty years of quickest economic growth ever. We call them “the Golden Age”. Never before population had grown so quickly, nor per capita GDP.
- Instead, global temperature slows down. Climate change scholars already know that there was an ongoing natural cooling trend compensating the impact of anthropogenic forces. They made their best efforts to attribute to human action and to natural action their fair part in global temperature behaviour.
- Even so, there is a lot to explain of the Golden Age cooling mystery. It even reaches the early 1980s, as the second oil crisis in these same early 1980s, provides a scenario of increasing fuel prices and relative slowing down of its usage precisely in the same moment when we start to gather new evidence on global warming.

# What to do to solve the paradoxes?

- **First** of all, clarify the historical correlation between GDP and CO<sub>2</sub>. This also implies revising the relationship between energy consumption and GDP. Luckily enough we have plenty of reasonable historical data on energy consumption –specially on the new, modern, energy consumption.
- **Second**, reassess the attribution models on global warming used by climate change scholars with the new GDP series. This implies to analyze and quantify the differences between resourcing to GDP and to CO<sub>2</sub> series and to other greenhouse gases.
- **Third**, check if there are -and if yes, how large are they- CO<sub>2</sub> repository effects powerful enough to have slowed down, and for many years, global warming, and if there are natural forcings with similar impact. If there are, explore why are they so powerful between 1945 and 1975. In other words, to understand global warming dynamics before it becomes the global warming we currently know.

# Extension 1: Agglomeration effects

- This will bring us, inevitably, to design models properly combining natural and anthropogenic forcings, looking for a change in the nature of the latter ones. For instance: its location on Earth Surface. We could suspect the impact of human activity on Earth temperature could have been different according to human activity concentration.
- In other words: how much does it matter its greater density and what is the impact of agglomeration effects? Is it comparable the impact of British industrialization, involving less than 10 millions people over less than 200.000 km<sup>2</sup> to that of the Chinese industrialization, involving 1.000 millions over three million km<sup>2</sup>?
- This alert us to take good advantage of “regional” data –i.e., continent wide or so- of GDP and temperature evolution during the last two centuries. We can contrast the impact of the various industrialization waves- British, Western European, North American, Soviet and Chinese- on climate change.

## Extension 2: Changing energy sources

- We also plan to explore the importance of changes in the composition of the “mix” of greenhouse gases. We suspect that an industrialization as the Chinese, by sheer demographic and geographic scale and because of the coal hegemony as main energy source could have produced global warming impacts much more important than those occurred in other historical moments, territories and energy sources. Let's remind the industrialization experiences based on an intensive use of hydraulic energy or in those based in massive consumption of oil (less CO<sub>2</sub> emitting than coal and solid mineral fossils).

The research strategy would be built around quantifying the contribution of the different factors to the variation of global temperature. This “attribution” methodology is quite the same than the decomposition strategy used in economic quantitative research.

Thank you very much  
for your time and attention!