28

Environment and Natural Resources

Eoin McLaughlin

The popular iconography of the landscape of the Industrial Revolution tends to show smoke billowing from chimneys in urban factories, thus highlighting two indistinguishable aspects of industrialisation: coal and pollution. These scenes of dirty cities and towns associated with our economic past have not been relegated to the dustbin of history; modern development in cities in India and China are reminiscent of these earlier images of industry. The study of environment and natural resources is, therefore, a relevant aspect of economic history and one with increasing contemporary resonance.

The past decade has seen increased research activity in both the fields of economic history and environmental economics (Kelly and Bruestle 2011; Rath and Wohlrabe 2016). Contemporary developments, such as economic recessions and climate change, are key drivers of research activity in both fields. The focus of this chapter is on the overlap of both sub-fields, *environmental economic history*, and outlines key contributions and research gaps in this area. The traditional research interests of environmental economics have primarily related to environmental policy instruments, cost-benefit of pollution control, non-market valuation and natural resource economics (renewable and non-renewable resources). More recently, there has been a shift in interest towards topics such as climate change and sustainable development. Also, following wider trends in economic research (Hamermesh 2013), environmental economics has shifted from a theoretical focus towards more applied empirical research (Kube et al. 2017).

© The Author(s) 2018
M. Blum, C. L. Colvin (eds.), *An Economist's Guide to Economic History*, Palgrave Studies in Economic History, https://doi.org/10.1007/978-3-319-96568-0_28

Certain topics in environmental economics are clearly not examinable using historical data—for example, stated preference methods for eliciting willingness to pay for environmental goods and services requires the use of surveys of living subjects. However, in other areas there is certainly scope for the input of historical research—for example, revealed preferences for environmental goods and services could be elicited using historical data on house prices, with the identification of environmental attributes such as distance from sources of pollution.

Elsewhere, there have been calls for greater integration of the sub-fields of environmental and development economics, dubbed "envirodevonomics" (Greenstone and Jack 2015). As many developing countries are experiencing environmental problems similar to what was previously undergone in developed countries (e.g. water and air pollution), historical perspective can be very useful as both a guide and for policy recommendations. However, developing countries are still underrepresented in many lines of research, for example, Alló and Loureiro (2014) find that the majority of studies on the preferences towards climate change policies were carried out in the US (52 per cent), followed by Europe (34 per cent), Asia (9 per cent) and Oceania (5 per cent). Along these lines, I would like to echo Greenstone and Jack (2015) and call for greater integration of environmental and economic history.

The focus of this chapter is on several key research themes that are cross-cutting along history and environmental lines; these include the resource curse, sustainable development, the "Environmental Kuznets Curve" (EKC) and climate change. The chapter finishes by highlighting areas of future research. As much of the research in environmental economics is dealing with uncertain future problems, insights from the past can help provide some illumination to guide us along this dark, uncertain path.

Resource Curse

Auty's (1993) study of development in mining economies coined the term "resource curse", namely that countries with an abundance of natural resources have tended to exhibit weak economic growth. A glut of empirical studies have shown such a relationship, most notably Sachs and Warner's (1995, 2001) finding that resource dependence had a significantly negative impact on economic growth over the period 1970–1989. This approach has been widely cited and the literature has taken both cross-country and in-country studies. An example of the latter is James and Aadlan's (2011) study of US counties over the period 1980 and 1995 which finds evidence of a resource curse. This literature has also been widely criticised, for example,

Brunnschweiler and Bulte (2008) highlight the fact that the measures of resource abundance used in the literature are actually more akin to measures of resource dependence and that resource abundance positively affects growth. More recent approaches to the resource curse have adopted more sophisticated empirical strategies. Smith (2015) is an example in this vein, focusing on the impact of resource discovery in a longitudinal setting, as opposed to the cross-sectional settings used in earlier studies, and finds no evidence of a resource curse effect on economic growth.

Moreover, the resource curse is counter-intuitive when we think of the historical record. The Industrial Revolution is synonymous with coal mining in Britain for one. The resource curse also does not sit with the experience of countries that have developed in the past and continue to develop using natural resource wealth, such as the USA and Australia) (Wright and Czelusta 2004, 2007). The use of the historical record leads to a more nuanced perspective. Barbier (2011) is a thorough scoping of the historical record to assess why countries do not succumb to the "curse of natural resources". Natural resources need not be considered a curse, but the development of linkages with other sectors of the economy and institutions to incentivise and facilitate such linkages are important facets in managing natural resource rents.

Sustainable Development

The United Nation's Sustainable Development Goals (SDGs), introduced in 2016 and planned to run until 2030, cover 17 areas with the main objective of ending poverty in all its forms and promoting "sustained, inclusive and sustainable economic growth". How to measure the sustainability of economic growth and development is clearly an important question, therefore. The economics of sustainable development focuses on the links between changes in comprehensive/inclusive wealth and future well-being (consumption). The central argument of the theoretical approaches to this question is that countries who fully utilise their gifts of nature are those that reinvest in other forms of capital. This has led to both the World Bank and the UN publishing reports of the sustainability prospects of countries. However, many of the theoretical models are set in infinite time and are future looking.

The core contribution of economic history here is to assess the empirical foundations of these theoretical models using the historical record by taking the vantage point of a hypothetical finance minister in 1800 or 1900 and looking 100 years into the future (i.e., within sample test of the model predictions), as opposed to a finance minister today looking into the future

with no way to test the predictions of the model. The earliest studies made empirical estimates that were approximates of the theoretical predictions. These were used to show whether a country was on a sustainable (positive) or unsustainable (negative) path (Hamilton and Clemens 1999). Studies have used historical data collected by the World Bank to test the Genuine Savings indicator. Ferreira et al. (2008) find weak evidence to support genuine savings as a predictor of future well-being. This methodology for testing genuine savings was followed by Greasley et al. (2014) and Hanley et al. (2016) who look at the historical record of Great Britain (1750–2000), US and Germany (1870–2000). Here they do find evidence in support of genuine savings as a predictor of future well-being. The key contribution of the historical record highlights aspects of the development process overlooked in the current World Bank/UN framework, particularly the importance of technological progress.

Environmental Kuznets Curve

Does economic development come at the expense of environmental quality, or is there a tendency for pollution to fall as society attains a certain level of income? The EKC, named after Simon Kuznet's findings of an "inverse U" between income inequality and economic development, is a literature that studies the link between environmental indicators (e.g. water pollution, air pollution, deforestation, biodiversity) and economic development (e.g. GDP per capita) (Dinda 2004). Sophisticated econometric methods have been applied to the study of the EKC using both modern and historical data. The use of either cross-sections or panels assumes that the income levels of separate nation states at a point in time are representative of stages of development. However, a more nuanced picture can be observed by tracing the historical development of individual countries and their corresponding pollution levels.

EKC studies using data from the more recent past, such as Grossman and Krueger (1995), look at a host of environmental indicators (urban air quality, oxygen regimes in river basis, faecal contamination of river basins, contamination of rivers by heavy metals) at different levels of aggregation. However, conducting similar research using longer run data is constrained by the lack of consistent recorded observation of environmental quality over time. Instead researchers have focused on a series of indicative pollutants, such as carbon dioxide (CO_2) and sulphur dioxide (SO_2) emissions, that have been estimated historically. Historical EKC studies have focused on country-specific and panel analyses using either SO_2 or CO_2 as the pollutant variable. Markandya

et al. (2006), in a panel of 12 European countries over the period 1870–2001, test for an EKC relationship between SO_2 and GDP; these authors find evidence of an EKC and suggest that this may be linked to environmental policy.

More recent contributions to the EKC literature have addressed the endogeneity between income and environmental degradation. Firstly, Lin and Liscow (2013) argue that there is a simultaneity bias in the EKC; increasing GDP may increase pollution, but pollution may harm health and thereby reduce GDP. Also, the estimated EKC relationship may suffer from omitted variable bias if an omitted third variable jointly causes both economic growth and environmental degradation.

Using debt service and age dependency as instruments, Lin and Liscow (2013) find evidence for EKC for 11 water pollutants over the period 1979–1999. Elsewhere, Sephton and Mann (2016) model UK CO_2 (1830–2003) and SO_2 (1850–2002) emissions using multivariate adaptive regression splines to estimate EKC relationship. They find strong evidence of an EKC and evidence of turning points for CO_2 in 1966 and SO_2 in 1967 that coincide with the passing of the Clean Air Act in 1956.

Climate Change

Climate change has spurred a large body of research. Within the economics literature, the unsettled debates primarily relate to the choice of discount rate and whether we cut emissions now or wait and cut (e.g. Stern versus Nordhaus), but these are normative questions that recourse to the historical record cannot settle. Although, it might be helpful to use the historical record to think about appropriate and realistic discount rates (see Gollier 2012 and the long-run data on interest rates in Homer and Sylla 2005). A growing body of literature focuses on the linkages between weather and economic outcomes in order to understand the economic consequences of potential climate change (see Dell et al. 2014 for a review). The importance of history is evident here as weather is determined in short horizons, but to analyse climate researchers need to focus on longer time horizons (decades, centuries, etc.). A recent example of this comes from Bleakley and Hong (2017), who study the economic impact of US weather patterns over 140 years.

Where history can be particularly relevant is in examining the impacts of natural disasters and mitigation efforts, and to get a better understanding of how past societies have adapted to changes in climate. Kahn's (2006) study of the frequency and mortality resulting from natural disasters sought to address

whether richer countries experience fewer natural disaster shocks and what factors helped mitigate natural disaster shocks. The relevance of this study to climate change is that that climate models predict future sea level rises and increases in the number of floods, therefore support for climate change policy depends on who benefits from this mitigation and where the impact of climate change will fall. The main findings were that high- and low-income countries were equally likely to experience a natural disaster but that the death tolls were lower in developed countries. The reasons for this were attributed to income levels (e.g. better early warning signals), institutions (e.g. democracy and lower inequality) and geography (i.e. Africa experienced fewer natural disasters).

Economists have used history as a quasi-laboratory to test the short-, medium- and long-run impact of environmental shocks. One such environmental shock is the American Dust Bowl that led to permanent soil erosion in the 1930s with some counties more affected that others. Hornbeck's (2012) use of contemporary data enables us to get a better insight into how people might adapt to climate disasters. In the short-term, the Dust Bowl led to changes in agricultural production to types more suited to the new environment although there were a number of constraints to adjustment including the lack of access to credit. Hornbeck found that one of the largest economic adjustments was through migration from high erosion counties relative to counties with lower erosion.

Future Research?

Greenstone and Gayer (2009) advocate for the increased application of quasi-experimental and experimental methods to help get a better understanding of key issues in environmental economics and to move away from associational findings towards more robust causal relationships. This call has led to greater use of experimental methods such as randomised control trials and choice experiments. But it has also led to several studies using historical events, such as recessions and historical policies, as natural experiments. This has been very prevalent in studies looking at the impact of pollution concentration on health outcomes such as birth weights, life expectancy and morbidity. Part of the difficulty in establishing causal relationships comes from the fact that pollution is not randomly assigned and there may be other confounding variables limiting statistical inference. Also, adult populations have the ability to move (residential sorting) and the lifetime exposure of adults to pollutants is unknown. Lastly, there may be "harvesting", that is, those that are already sick may be the ones who die.

Chay and Greenstone (2003) is a landmark study in this vintage. They exploit spatial variation in particulates arising from the 1981 to 1982 recession in the US. Their main finding is that there were 2500 fewer infant deaths in areas that experienced a fall in total suspended particulates compared with areas that experienced no such falls. Another example of this approach comes from Chen et al. (2013), who study the effect of the Haui River policy on health outcomes in China. The Huai River policy is a historical scheme implemented by the Chinese government from 1950 to 1980s and gave free coal for winter heating to residents north of the Haui River, while at the same time exploiting the *hukou* system of household registration that restricted mobility. Using a discontinuity design, Chen et al. (2013) find a discontinuity in both total suspended particulates and life expectancy at the Haui River, attributing the lower life expectancy to the worse air quality north of the river. There is clearly scope for more work of this type for other historical contexts.

Conclusion

Economic history and environmental economics can learn from each other and can also be useful in the classroom. How the economic environmental dynamic has evolved over time can offer valuable insights for environmental policy. Hanley et al.'s (2011) environmental economics textbook uses historical examples of exogenous (changes in climate led to reduced yields and affected land settlement in Neolithic Scotland) and endogenous (changes in how land was irrigated for cotton irrigation in nineteenth-century Egypt) coevolution of the economic environmental system. Likewise, an understanding of the environment can be insightful for our understanding of economic history. Siegler's (2016) textbook on US economic history contains chapters explicitly relating to environmental issues such as externalities and illustrates the importance of natural capital in US economic development. History can also provide useful real-world case studies of private solutions to environmental problems (Dingle, 1982; Desrochers, 2008) and some examples of managing common pool resources, such as Leuck's (2002) excellent study of the extermination and conservation of American Bison. Here a nice counterpoint could be made with Steckel and Prince's (2001) study of Native American anthropometrics, as their main food source was bison.

In terms of future research, in their call for envirodevonomics, Greenstone and Jack (2015) identified one big question: 'why is environmental quality so poor in developing countries?' The answers they suggest are a greater willingness to pay for consumption over environment, a higher marginal costs of environmental improvement, political economy distortions of the policy

process, or market failures (e.g. information asymmetry) distort people's true willingness to pay. This big question, and related sub-questions, could also be asked of the historical record: why was environmental quality so poor during industrialisation, what were the health burdens of poor environmental quality and what were the implications for productivity and growth? These are questions that have driven past research in economic history (e.g. Ferrie and Troesken 2008) and are still relevant today.

Reading List

Alló, M., and M.L. Loureiro. 2014. The Role of Social Norms on Preferences towards Climate Change Policies: A Meta Analysis. *Energy Policy* 73: 563–574.

Auty, R.M. 1993. *Sustaining Development in Mineral Economies: The Resource-Curse These*. London: Routledge.

Barbier, E. 2011. *Scarcity and Frontiers: How Economies Have Developed through Natural Resource Exploitation*. Cambridge: Cambridge University Press.

Bleakley, H., and S.C. Hong. 2017. Adapting to the Weather: Lessons from U.S. History. *Journal of Economic History* 77 (3): 756–795.

Brunnschweiler, C.N., and E.H. Bulte. 2008. The Resource Curse Revised: A Tale of Paradoxes and Red Herrings. *Journal of Environmental Economics and Management* 55 (3): 248–264.

Chay, K.Y., and M. Greenstone. 2003. The Impact of Air Pollution on Infant Mortality: Evidence from Geographic Variation in Pollution Shocks Induced by a Recession. *Quarterly Journal of Economics* 118 (3): 1121–1167.

Chen, Y., A. Ebenstein, M. Greenstone, and H. Li. 2013. Evidence on the Impact of Sustained Exposure to Air Pollution on Life Expectancy from China's Huai River Policy. *PNAS* 110 (32): 12936–12941.

Dell, M., B.F. Jones, and B.A. Olken. 2014. What Do We Learn from the Weather? The Climate-Economy Literature. *Journal of Economic Literature* 52 (3): 740–798.

Desrochers, P. 2008. Did the Invisible Hand Need a Regulatory Glove to Develop a Green Thumb? Some Historical Perspective on Market Incentives, Win-Win Innovations and the Porter Hypothesis. *Environment and Resource Economics* 41 (4): 519–539.

Dinda, S. 2004. Environmental Kuznets Curve Hypothesis: A Survey. *Ecological Economics* 49 (1): 431–455.

Dingle, A.E. 1982. "The Monster Nuisance of All": Landowners, Alkali Manufactures, and Air Pollution, 1828–1864. *Economic History Review* 35 (4): 529–548.

Ferreira, S., K. Hamilton, and J.R. Vincent. 2008. Comprehensive Wealth and Future Consumption: Accounting for Population Growth. *World Bank Economic Review* 22 (2): 233–248.

Ferrie, J.P., and W. Troesken. 2008. Water and Chicago's Mortality Transition, 1850–1925. *Explorations in Economic History* 45 (1): 1–16.

Gollier, C. 2012. *Pricing the Planet's Future: The Economics of Discounting in an Uncertain World*. Princeton, NJ: Princeton University Press.

Greasley, D., N. Hanley, J. Kunnas, E. McLaughlin, and L. Oxley. 2014. Testing Genuine Savings as a Forward-Looking Indicator of Future Well-Being over the (Very) Long-Run. *Journal of Environmental Economics and Management* 67 (2): 171–188.

Greenstone, M., and T. Gayer. 2009. Quasi-Experimental and Experimental Approaches to Environmental Economics. *Journal of Environmental Economics and Management* 57 (1): 21–44.

Greenstone, M., and B.K. Jack. 2015. Envirodevonomics: A Research Agenda for an Emerging Field. *Journal of Economic Literature* 53 (1): 5–42.

Grossman, G.M., and A.B. Krueger. 1995. Economic Growth and the Environment. *The Quarterly Journal of Economics* 110 (2): 353–377.

Hamermesh, D.S. 2013. Six Decades of Top Economics Publishing: Who and How? *Journal of Economic Literature* 51 (1): 162–172.

Hamilton, K., and M. Clemens. 1999. Genuine Savings in Developing Countries. *World Bank Economic Review* 13 (2): 333–356.

Hanley, N., L. Oxley, D. Greasley, E. McLaughlin, and M. Blum. 2016. Empirical Testing of Genuine Savings as an Indicator of Weak Sustainability: A Three-Country Analysis of Long-run Trends. *Environmental and Resource Economics* 63 (2): 313–338.

Hanley, N., J. Shorgen, and B. White. 2011. *Introduction to Environmental Economics*. Oxford: Oxford University Press.

Hanna, R., and P. Oliva. 2015. The Effect of Pollution on Labor Supply: Evidence from a Natural Experiment in Mexico City. *Journal of Public Economics* 122: 68–79.

Homer, S., and R. Sylla. 2005. *A History of Interest Rates*. Hoboken, NJ: Wiley Finance.

Hornbeck, R. 2012. The Enduring Impact of the American Dust Bowl: Short- and Long-run Adjustments to Environmental Catastrophe. *American Economic Review* 102 (4): 1477–1507.

James, A., and D. Aadland. 2011. The Curse of Natural Resources: An Empirical Investigation of U.S. Counties. *Resource and Energy Economics* 33 (2): 440–453.

Kahn, M.E. 2006. The Death Toll from Natural Disasters: The Role of Income, Geography, and Institutions. *Review of Economics and Statistics* 87 (2): 271–284.

Kelly, M.A., and S. Bruestle. 2011. Trend of Subjects Published in Economics Journals, 1969–2007. *Economic Inquiry* 49 (3): 658–673.

Kube, R., A. Loschel, H. Mertens, and T. Requate. 2017. 40 Years of JEEM: Research Trends and Influential Publications in Environmental and Resource Economics. *CAWM Discussion Paper Series*, Paper No. *95*.

Lin, C.Y.C., and Z.D. Liscow. 2013. Endogeneity in the Environmental Kuznets Curve: An Instrumental Variables Approach. *American Journal Agricultural Economics* 95 (2): 268–274.

Lueck, D. 2002. The Extermination and Conservation of the American Bison. *The Journal of Legal Studies* 31 (2): S509–S652.

Markandya, A., A. Golub, and S. Pedroso-Galinato. 2006. Empirical Analysis of National Income and SO2 Emissions in Selected European Countries. *Environmental and Resource Economics* 35 (3): 221–257.

Rath, K., and K. Wohlrabe. 2016. Trends in Economics Publications Represented by JEL Categories between 2007 and 2013. *Applied Economic Letters* 23 (9): 660–663.

Sachs, J.D., and A.M. Warner. 1995. Natural Resource Abundance and Economic Growth. *NBER Working Paper Series*, Paper No. w5398.

———. 2001. Natural Resources and Economic Development: The Curse of Natural Resources. *European Economic Review* 45 (4–6): 827–838.

Sephton, P., and J. Mann. 2016. Compelling Evidence of an Environmental Kuznets Curve in the United Kingdom. *Environmental and Resource Economics* 64 (2): 301–315.

Siegler, M.V. 2016. *An Economic History of the United States: Connecting the Present with the Past*. New York: Palgrave Macmillan.

Smith, B. 2015. The Resource Curse Exorcised: Evidence from a Panel of Countries. *Journal of Development Economics* 116: 57–73.

Steckel, R.H., and J.M. Prince. 2001. Tallest in the World: Native Americans of the Great Plains in the Nineteenth Century. *American Economic Review* 91 (1): 287–294.

Wright, G., and J. Czelusta. 2004. Why Economies Slow: The Myth of the Resource Curse. *Challenge* 47 (2): 6–38.

———. 2007. Resource-Based Growth: Past and Present. In *Natural Resources. Neither Curse nor Destiny*, ed. D. Lederman and W.F. Maloney. Stanford, CA: Stanford University Press.