

Biggest Open Questions in Economic History

Economic history seeks to explain how economies evolve over the long run and why some regions prosper while others lag behind. Despite much progress, several fundamental questions remain open. Broadly, these can be grouped into **(1) theoretical debates** about deep causes of economic development, **(2) empirical puzzles** regarding specific historical events and patterns, and **(3) methodological gaps** in the tools and data available to researchers. Below, each of these areas is discussed in turn, with examples of major questions and an explanation of how the research of Christian Vedel connects to and sheds light on them. Vedel's work – spanning topics from the role of geography and culture to micro-level productivity and innovative data methods – helps illuminate these debates, introduces new evidence and techniques, and in some cases challenges prevailing narratives.

Theoretical Questions in Economic History

Geography vs. Institutions – What drives long-run prosperity? One of the oldest and biggest debates is whether **geography** (climate, natural resources, location) or **institutions** (laws, governance, property rights) are the primary determinants of economic development ¹. A predominant consensus stemming from influential work by Acemoglu, Johnson, and Robinson holds that institutions are the “fundamental cause” of long-run growth, with geography only affecting development indirectly through institutions ¹. For example, the extractive institutions established in colonies have been blamed for persistent poverty in some regions ¹. On the other hand, some researchers argue that geography has a first-order effect: for instance, satellite imagery analysis shows that first-nature geographic factors (like agricultural potential and access to trade routes) can explain nearly half of the global variation in economic activity ². Even within Europe, there is evidence that geography matters, though perhaps less so than institutional quality ². This “geography vs. institutions” question remains unresolved, and Christian Vedel's research contributes important new evidence to it. In his award-winning paper *“A Perfect Storm: First-Nature Geography and Economic Development,”* Vedel exploits a dramatic historical natural experiment to isolate the impact of geography. In 1825, a storm in Denmark breached the Agger Isthmus, creating a new navigable channel and suddenly granting the previously isolated Limfjord region direct access to the North Sea ³. Vedel's analysis uses a difference-in-differences approach, comparing the affected region to unaffected areas, and finds that this exogenous geographic improvement *immediately* boosted trade and, within a generation, raised local population by about 26.7% (an elasticity of 1.6 with respect to market access) ³. Importantly, he documents mechanisms: the population growth was driven by higher fertility and economic diversification into fishing and manufacturing, rather than by in-migration ³. Equally telling, he finds a “mirror image” case of geography in reverse: a medieval closure of a previous outlet (circa 1086–1208) led to long-run decline, evidenced by fewer coin finds and building remains in that period ⁴. Together, these results provide **robust causal evidence that first-nature geography directly shapes the location of economic activity** ⁴. In other words, Vedel's work demonstrates that geography *can* be destiny – a strong challenge to the view that geography is merely a backdrop to institutional causes. His findings confirm that natural endowments (like access to waterways) can independently determine regional prosperity ⁵. At the same time, his research also observes that geography-induced growth spurred *institutional adaptation* (e.g. local infrastructure and market institutions evolved to accommodate the trade boom) ⁶, suggesting a nuanced view: geography **and** institutions are deeply interconnected over time. By providing clear evidence

from a “natural experiment” in 19th-century Denmark, Vedel's *Perfect Storm* study advances this theoretical debate, showing that favorable geography gave regions a head start that institutions later reinforced ³

⁶ .

Long-Run Growth Determinants and the Industrial Revolution. Another open theoretical question is what fundamental factors ignite and sustain **long-run economic growth**. The British Industrial Revolution (circa 1750–1850) is often seen as the pivotal break to modern growth, yet its causes are still debated. Some theories emphasize **culture and knowledge** – for example, Joel Mokyr argues that Britain's Enlightenment-era intellectual climate fostered innovation and a cadre of skilled engineers, making scientific advances highly valued ⁷ . In contrast, Robert Allen highlights **economic incentives**, contending that Britain's unique combination of **high wages and cheap coal** made labor-saving technologies (like the steam engine) profitable to adopt, whereas other countries with different factor prices lagged behind ⁸ . Others point to **institutions** (e.g. secure property rights and patent laws), or access to **colonial resources and trade**, as critical enablers of industrial takeoff. These hypotheses are not mutually exclusive, and the “why Britain first?” puzzle remains an active field of research. While Christian Vedel's work does not directly tackle the 18th-century Industrial Revolution in Britain, it speaks to the broader question of growth drivers by examining analogous mechanisms in later historical contexts. For instance, his study on energy diversification in early 20th-century Denmark shows how **resource constraints and technological adaptation** can shape productivity – a microcosm of industrialization dynamics. In *“Adaptability, Diversification, and Energy Shocks: A Firm Level Productivity Analysis,”* Vedel and co-authors investigate Danish industry during and after World War I, when a wartime coal shortage forced firms to turn to local peat as an alternative fuel ⁹ . Exploiting detailed data from Danish butter factories (creameries) between 1900 and 1928, they find that firms located near peat deposits achieved significantly higher productivity in the wake of the coal shock ¹⁰ . Strikingly, these productivity gains persisted even after coal became available again ¹⁰ . This implies that temporary energy adversity spurred lasting efficiency improvements – perhaps through investments in new technology or processes – that gave firms a long-run edge. Such evidence resonates with the idea that **factor price shocks and resource endowments can drive innovation**, much as Allen suggested for Industrial Revolution Britain (where expensive labor and accessible coal prompted mechanization) ⁸ . In Denmark's case, **adaptability to an energy crisis** enhanced long-term growth potential, highlighting the importance of flexibility and technology adoption as determinants of growth. More generally, Vedel's research across different topics underscores that **multiple factors – geography, institutions, culture, technology, and resource shocks – interplay in shaping long-run growth**. His work on Danish dairy cooperatives, for example, illustrates how **organizational innovation and social capital** contributed to productivity gains in agriculture, a critical sector in many economies' development. The cooperative creameries introduced new technologies (like the automatic cream separator) and practices collectively, helping Denmark rapidly increase butter output around the turn of the 20th century. This speaks to the role of **institutional innovations at the micro-level** (cooperative structures) in facilitating technological diffusion and growth – complementing the macro-level determinants like geography and national policies.

Persistence and Path Dependence vs. Change. A further theoretical issue is the degree of **persistence** in economic outcomes over time. Why do some regional or societal disparities endure for centuries (implying strong path dependence), while others are reversed or diminished by later events? The persistence of inequality – whether between countries (the North-South divide, the “Great Divergence” between Western Europe and Asia) or within countries (e.g. persistent regional wealth gaps) – is not fully understood. Some scholars argue that initial advantages or disadvantages (geographic, institutional, or cultural) tend to self-reinforce, leading to long-run divergence. Others point out historical turning points where fortunes

changed – suggesting contingency and **critical junctures** matter. Christian Vedel's findings contribute nuanced insights here. His *Perfect Storm* study is a vivid example of a shock overcoming persistence: northwestern Jutland had been relatively poor and peripheral for centuries, but the 1825 geographic shock abruptly transformed its trajectory, bringing it into the network of thriving trading towns ³. This indicates that while certain inequalities may persist under stable conditions, they can be **rapidly altered by exogenous changes** (in this case, a change in transport geography). Conversely, the medieval closure of the Limfjord outlet that Vedel documents shows an initially prosperous region stagnating for hundreds of years after losing its access to the sea ⁴. Together, these cases underscore path dependence (the region languished when its trade route was gone) *and* the potential for reversal (once the route reopened, growth resumed). Persistence of cultural traits is another facet – for example, how long do immigrant communities maintain their distinct identity and outcomes? Vedel addresses this in his research on **assimilation and cultural identity among Danish-Americans**. In *“Assimilate for God: The Impact of Religious Divisions on Danish American Communities,”* co-authored with Bentzen, Sharp, and others, he examines how a split in the immigrant community's religious institutions affected cultural persistence vs. assimilation ¹¹. Danish migrants in the U.S. in the late 19th century divided into two Lutheran church factions – the so-called “Happy Danes” who aimed to preserve Danish language and customs, and the “Holy Danes” who embraced an Americanizing, revivalist approach ¹¹. This split can be seen as a natural experiment in cultural persistence. Vedel and colleagues find that in counties with a “Happy Dane” church (pro-tradition), immigrants continued to give their children traditionally Danish names at higher rates, whereas in communities led by “Holy Dane” churches (pro-assimilation), the use of Danish first names declined faster in favor of more American-sounding names ¹¹. They also show that newspapers read by the assimilationist group shifted more rapidly from Danish to English language over time ¹¹. In short, **religious institutions influenced the persistence of ethnic culture**: when church leaders encouraged preserving heritage, cultural assimilation slowed, and where leaders encouraged integration, immigrants assimilated more quickly ¹¹. This finding highlights that persistent cultural gaps are not immutable – they respond to social incentives and institutional context. Notably, the study implies that *cultural persistence can have economic implications*, since cultural assimilation is often linked to economic integration and success in the host society ¹². By illuminating how an internal community debate (secular vs. religious approach) altered the trajectory of Danish-Americans' identity, Vedel's work connects to broader debates on how long **cultural and economic legacies** last and what triggers change.

Does culture (e.g. religion) matter for economic performance? A related theoretical question is the role of **culture, values, and religion** in economic outcomes. Since Max Weber's famous thesis on the “Protestant ethic” and the spirit of capitalism, economists have sought to determine whether religious and cultural differences can cause divergent economic performance. This is tricky to disentangle because culture often correlates with other factors. Vedel's research provides concrete evidence on this front by examining a unique cultural episode in Denmark. In *“Holy Cows and Spilt Milk: The Impact of Religious Missions on Firm-Level Productivity,”* Vedel and co-authors investigate how a **pietistic religious revival** around the early 1900s affected the dairy industry ¹³. Denmark at the time was predominantly Protestant and culturally homogeneous, but a new Inner Mission movement swept through, emphasizing strict Sabbath observance and moral reform. Crucially, this religious revival coincided with the boom in cooperative creameries (the butter factories). By compiling firm-level productivity data for 964 creameries and measuring the intensity of the pietist movement in different areas, the study is able to isolate the impact of religiosity on economic performance ¹⁴. The results are striking: regions more affected by the religious mission saw **lower creamery productivity**, and the analysis (leveraging variations in preaching activity by a prominent evangelist as an instrument) suggests this relationship is causal ¹³. The mechanism appears to be twofold. First, the pietist influence enforced **Sunday closures**, meaning devout communities

kept their dairies shut on Sundays, losing production time or flexibility. Second, religious disagreements led to **fragmentation of cooperatives** – in some villages, disputes over faith led to multiple smaller creameries being formed instead of one efficient, unified cooperative ¹³. Both factors hampered efficiency. These findings provide a nuanced perspective in the culture-and-economy debate: rather than the Protestant ethic universally boosting work effort, a specific brand of zealous Protestant revival actually *reduced* industrial productivity in this context by imposing social constraints ¹³. This challenges any simple narrative that religion is either unequivocally good or bad for economic performance. Instead, it shows **cultural values can have concrete economic costs or benefits depending on how they interact with business practices**. Vedel's contribution here is notable for offering **causal evidence** at the micro level – something often difficult in cultural economics. It illuminates a broader theoretical point: informal institutions and norms (like religious norms about work and community cooperation) are part of the development process. In sum, across these theoretical issues – geography vs. institutions, the roots of growth, persistence of advantage, and cultural impacts – Christian Vedel's work engages directly with the debates. By leveraging historical “experiments” and new data, his research confirms some existing theories (e.g. geography's importance ³ ⁵) while challenging others (e.g. the notion that more religion uniformly fosters productivity ¹³), and it underscores the complex interplay of factors that economic historians must consider.

Empirical Puzzles and Unresolved Historical Questions

Beyond broad theory, economic history is replete with **specific puzzles and empirical questions** about particular events, transitions, or measurement challenges. Researchers often grapple with explaining *how* and *why* certain outcomes happened as they did. We highlight a few such puzzles – measuring institutional change, the causes of key historical turning points like industrialization, and divergences in performance across regions or sectors – and examine how Vedel's research addresses aspects of these puzzles by providing new evidence or approaches.

Measuring Institutional Change and Its Effects. Institutions (the “rules of the game” in an economy) are notoriously hard to measure, especially in historical settings. How can we quantify changes in governance, legal systems, or social norms in the past, and how do we know those changes' effects on economic outcomes? This is an empirical puzzle because records may be sparse and institutions are often qualitative. Economic historians have used creative proxies – from counting the number of parliamentary acts, to coding historical constitutions, to using missionary activity as a proxy for informal institutional influence. Christian Vedel's work offers illustrative examples of measuring and testing institutional change. The **Danish-American assimilation study** is one case: the “institutional change” in question was the **ordination of a controversial pastor in 1883** that split the Danish immigrant church into two factions ¹¹. This schism created a clear before-and-after and a treatment-vs-control (counties with a “Happy” Danish church vs. those with a “Holy” Danish church) – effectively a **difference-in-differences setup** to measure the impact of that institutional divergence ¹². By leveraging data from U.S. censuses (for names of children) and ethnic newspapers (for language usage), Vedel and colleagues could **quantify cultural assimilation** as an outcome ¹¹. The ability to track something like “degree of assimilation” over time was itself a methodological feat, relying on detailed archival work (linking church locations, translating newspaper text, etc.). The empirical finding – that one can detect a measurable difference in naming patterns and language due to the church split – demonstrates that even subtle institutional changes (a community's religious orientation) leave empirical traces if one knows where to look. Another example is Vedel's research on the **“Inner Mission” religious movement in Denmark** and its economic impact. Here the puzzle is to measure the prevalence of a religious revival over space and time. The authors compiled

data on things like the number of local mission house meetings or the presence of key preachers to create an index of religiosity intensity ¹⁴. They then correlated this with firm productivity data. Solving the empirical challenge of measuring a diffuse social institution (a revival movement) allowed them to test its effect rigorously ¹³. These examples show how new data sources (church archives, missionary records, newspapers, firm accounts) can be marshaled to quantify institutional phenomena that were previously qualitative, thus helping resolve puzzles about **cause and effect** in historical institutional change. Vedel's work, by using these innovative measurements, helps answer questions like: *Did a change in church policy affect immigrant economic integration?* (Yes, in the Danish-American case, it did ¹¹.) *Did a grassroots religious movement alter economic behavior of firms?* (Yes, it hindered dairy productivity through stricter norms ¹³.) These contribute to a larger empirical literature seeking to pin down how changes in formal or informal institutions translate into economic outcomes – a core concern in economic history.

Origins of Economic Divergence: Why do some regions or sectors forge ahead? Economic history is often concerned with explaining **divergences in performance** – why some countries, regions, or industries grow faster or become more productive than others. Classic puzzles include the rise of Western Europe vs. the stagnation of other parts of the world (“the Great Divergence”), the North-South income gap in Italy, or sectoral shifts like why agriculture improved dramatically in some places but not others. At a finer scale, historians ask: why did two seemingly similar regions experience different economic fates? Christian Vedel's research offers case studies that speak to these divergence puzzles, often by comparing regions or communities with and without certain interventions or attributes. One compelling example is the **Danish vs. Irish dairy industries in the late 19th and early 20th centuries**. Denmark and Ireland were both rural, dairy-oriented economies, yet Denmark's cooperative creameries are celebrated for spearheading an agricultural transformation, whereas Ireland's experience was more fraught. Vedel has collaborated on research that directly compares these experiences. In *“A Microlevel Analysis of Danish Dairy Cooperatives: Opportunities for Large Data in Business History,”* Vedel (with Sharp, Henriques, McLaughlin, and Tsoukli) helped create a novel panel dataset of **1,419 Danish cooperative creameries from 1898–1945 with 131 variables each** ¹⁵ – essentially opening up the “black box” of this sector. Using this rich data, they document significant regional heterogeneity in productivity (measured by the milk-to-butter conversion efficiency) and other performance metrics ¹⁶. This allowed them to identify which regions were leading and which lagging, and to explore factors like technology adoption and even expenditures on things like fire insurance. The Danish data reveal that while productivity rose overall (thanks to the spread of best practices), there was a persistent **core-periphery pattern** – some districts (often in Denmark's dairy heartland) consistently outperformed others ¹⁷ ¹⁸. Why might that be? One hypothesis is differences in social capital or local leadership; another is timing of cooperative formation. To probe deeper, Vedel and co-authors have extended analysis to **Ireland**, where cooperatives were introduced in the 1890s but met resistance from private dairy interests and sometimes local hostility. In the working paper *“Milk Wars: Cooperation, Contestation, Conflict and the Irish War of Independence,”* Vedel (with McLaughlin, Sharp, and Skovsgaard) tackles the puzzle of why Irish cooperatives did not replicate Denmark's seamless success and instead became entangled in conflict. They uncover that areas with cooperative creameries in Ireland experienced **greater local violence and social conflict**, particularly during the turbulent period of the War of Independence (1919–21) ¹⁹. Through new data linking the location of co-ops and incidents of agrarian violence, they find a significant positive correlation between cooperative presence and conflict intensity, even controlling for many factors ¹⁹. Using an instrument (prior suitability for dairying in an area) to account for where co-ops formed, they argue this relationship is causal: the introduction of co-ops **disrupted existing market structures and social relations, sparking contention and even violence** ¹⁹. In essence, **cooperation bred conflict** in the Irish case – a stark contrast to Denmark, where cooperatives were largely embraced. This research addresses an empirical puzzle: the divergent outcomes of a similar

institutional innovation in two countries. It suggests that the context (Ireland's lower social capital or existing vested interests) caused cooperatives to have a very different social impact, thereby slowing their economic benefits. Vedel's involvement in these studies highlights how fine-grained historical data and clever identification can explain divergence. Denmark's dairy sector surged ahead thanks to cooperatives, whereas Ireland's lagged due to conflict – a finding that nuances the narrative that “cooperatives automatically equal success.” It also informs the broader question of **why some communities successfully adopt productive innovations and others do not**.

Vedel's *energy shock* study provides another angle on divergence: even within Denmark, when the coal crisis hit around WWI, not all firms fared equally. Those in peat-rich locales could adapt and maintain output, while those elsewhere struggled ¹⁰. This created a divergence in firm performance that persisted beyond the crisis. Empirically, this is a puzzle of **resilience** – why did some firms manage better? The answer, in this case, lay in geographic luck (access to peat) and the ability to diversify energy sources ¹⁰. By quantifying firms' productivity and mapping them against peat deposits, Vedel and colleagues could measure this divergence precisely. Such analysis not only solves the historical question (who gained and how much) but also has modern implications – it speaks to how regional economic resilience to shocks can produce long-term gaps, a relevant insight for today's energy transitions.

The Causes of the Industrial Revolution and Other Transformative Events. We have touched on the theoretical debate about the Industrial Revolution; empirically, the question is: *what combination of factors actually sparked sustained industrial growth in 18th-century Britain?* This remains partially unresolved because evidence can support multiple narratives. While Vedel's work doesn't directly excavate 18th-century archives, his research on later periods mimics the approach needed to crack such puzzles: combining micro-data with natural experiments to weigh competing explanations. For instance, to test the importance of **knowledge spillovers vs. factor prices**, one could look at cases where one factor varies but not the other. Vedel's geography paper effectively did this for trade access – akin to asking, “if we give a region better access (like a canal), does it industrialize/grow?” The answer was yes: trade access alone substantially raised population and shifted occupations toward industry ³. This parallels the Industrial Revolution question of whether access to **trade (e.g., Atlantic trade in Britain's case)** was a key driver. His findings lend support to the notion that improved access to markets can kickstart local development, an empirical point also suggested in other contexts by, say, Robert Allen (who noted Britain's access to coal and colonial markets). Similarly, his energy study, by showing **innovation in response to high coal prices**, provides empirical backing to the importance of **relative factor prices** in driving technological change – a key piece of the Industrial Revolution puzzle ¹⁰ ⁸. While not a direct test of 18th-century Britain, it gives credibility to the idea that where fuel was cheap (or alternatives available), industrial progress followed. If we zoom out, the methodologies and insights from Vedel's empirical projects illustrate how historians are tackling big puzzles: through **granular datasets, identification strategies, and interdisciplinary evidence**. For example, to understand the **long-run divergence between Europe and Asia**, one might compile city-level data over centuries or use natural experiments like the Columbian exchange or monsoon deviations. Vedel's approach to other questions – e.g., using archaeological finds to proxy medieval trade activity ⁴, or using textual analysis of newspapers to gauge cultural change ²⁰ – could be similarly applied to these big puzzles. His work demonstrates the trend in economic history toward **answering old puzzles with new evidence**. By connecting micro-level changes (a new channel, a new cooperative, a new religious leader) to macro outcomes, Vedel's research helps bridge the gap between individual historical events and broader economic-historical phenomena.

In summary, many empirical puzzles in economic history revolve around understanding *how* a particular change affected the economy and *why* outcomes differed across cases. Christian Vedel's studies address these puzzles by zeroing in on concrete historical episodes – from the Danish Limfjord storm to transatlantic immigrant communities – and providing evidence for their causes and consequences. By doing so, his work not only answers the immediate historical questions (e.g., *what was the effect of the 1825 channel?*) but also enriches our understanding of analogous puzzles (e.g., *can geography alone cause growth?*). Each empirical finding – be it the conflict-inducing nature of cooperatives in Ireland ¹⁹ or the productivity boost from energy adaptability in Denmark ¹⁰ – either challenges or confirms narratives. For instance, the Irish “Milk Wars” finding challenges the rosy narrative that cooperatives always reflect high social capital and benefit communities, showing they could also **undermine social cohesion** in certain settings ²¹. On the other hand, the Danish cooperative data largely confirm the narrative of Denmark's agricultural success while adding detail about regional differences ¹⁷. All these contribute to refining the empirical record and resolving historical debates piece by piece.

Methodological Gaps and Innovations in Economic History

Addressing the above theoretical and empirical questions would not be possible without the right data and methods. Historically, economic history has often been data-constrained – reliant on whatever records survived – and has sometimes lagged in adopting the latest analytical tools. Today, however, the field is experiencing a **methodological renaissance**, as researchers compile vast new datasets (from archives, digitization, and even archeology) and employ advanced techniques (machine learning, GIS mapping, causal inference models) to analyze them. Still, challenges remain: gaps in data coverage, difficulties in measurement, and the need to integrate new methods appropriately. Christian Vedel's work is at the forefront of these methodological advancements, directly tackling some of the field's biggest hurdles.

Data Availability and Big Data in History: One major gap has been the lack of **large-scale, granular data** on historical economies. Traditional economic history often relied on aggregate statistics or small samples. Vedel and collaborators have significantly expanded data availability in several areas. A prime example is the creation of the detailed **Danish creamery database** mentioned earlier ¹⁵. By painstakingly digitizing decades of annual reports from over 1,400 cooperative dairies – recording inputs, outputs, prices, membership, etc. – they produced a longitudinal firm-level dataset of a scope rarely seen in business history ¹⁵. This opens the door for many analyses: productivity distributions, risk management (they even extracted data on fire insurance payments), entry and exit of firms, and so on ¹⁶. Crucially, they made this database **publicly available to the scholarly community** ¹⁵, exemplifying the new ethos of open data in economic history. Such data allow researchers to move beyond anecdotal case studies to more **quantitative, generalizable insights** – for example, measuring how much variation in butter output was due to technology vs. management. In the same vein, Vedel's involvement in compiling Irish creamery data and conflict records expanded data availability for Ireland's economic history, enabling rigorous comparisons with Denmark. Another area of data innovation is the **use of unconventional sources**: Vedel's *Perfect Storm* study integrated data from historical maps (shipping routes), parish-level population censuses, and even an **archaeological register of coin finds and building remains** to assess medieval economic activity ⁴. Using archaeological evidence as quantitative data is relatively novel and helped fill a gap for the pre-modern period where written records were scarce. It illustrates how economic historians are widening what “counts” as data. Similarly, the assimilation study tapped **church records and ethnic newspapers** – sources that had to be gathered from archives and digitalized – to quantify cultural outcomes ²⁰. Each of these efforts fills a methodological gap by **making new data available** and often by

merging data from different domains (economic, demographic, cultural, etc.), thereby providing a richer picture of the past.

Measurement Techniques and Standardization: Even when data exist, a common problem is making them **comparable and analyzable**. Occupations, for instance, are recorded in myriad ways across countries and time periods, making it hard to study social mobility or structural change. This is where Vedel's methodological innovation *OccCANINE* comes in. *OccCANINE* (Occupational CANINE) is a tool he co-developed to automatically standardize historical occupation titles into a common classification (HISCO) ²² ²³. Traditionally, researchers manually coded job titles – a laborious and error-prone process that could take months for large samples. Vedel and co-authors fine-tuned a **natural language processing model (based on Google's CANINE transformer)** to perform this task in seconds ²⁴ ²⁵. They trained it on an unprecedented 14 million occupation–HISCO pairs in 13 languages, contributed by 22 projects around the world ²⁶. The resulting model achieves over 90% accuracy in matching occupations to standardized codes ²⁶. By “breaking the HISCO barrier” ²⁷, *OccCANINE* makes vast troves of occupation data **readily usable for quantitative analysis** that were previously locked up in handwritten or idiosyncratic form. This is a major methodological leap: for example, it enables researchers to study occupational mobility or the spread of industrial jobs across countries without spending years on data cleaning. *OccCANINE* directly addresses the **measurement gap** in historical data by using machine learning to enhance accuracy and efficiency ²⁵. It's also a pioneering instance of **machine learning in economic history**, demonstrating that modern AI tools can be adapted for historical text and classification tasks. By introducing *OccCANINE*, Vedel not only solved a practical problem for his own research (standardizing Danish census jobs, for instance) but also provided a public good to the field, with broad applicability in economic history and related disciplines ²⁸. This reflects a broader trend where historians are adopting techniques like OCR (optical character recognition), text mining, and now deep learning to convert unstructured historical sources into structured data.

Beyond *OccCANINE*, Vedel's work also showcases innovative measurement in other ways. In the religious impact study, measuring “intensity of pietist mission” required combining qualitative historical knowledge with quantitative proxies (like number of sermons by a famous preacher). In the assimilation study, measuring assimilation involved coding **name ethnicity** (deciding if a baby name was Danish or English origin) and analyzing linguistic changes in newspapers (possibly using keyword counts or even more advanced text analysis). These are not trivial tasks – they involve new metrics and validation. By successfully implementing them, Vedel's studies point the way for others to quantify concepts like cultural retention or social capital in historical settings. This helps fill the methodological gap of **how to measure soft social variables over time**.

Integration of Advanced Methods – Causal Inference and Machine Learning: Economic history has increasingly embraced the toolkit of modern economics, especially **causal inference methods** that aim to identify cause-effect relationships rather than just correlations. However, applying these methods to historical data can be challenging due to data limitations or the uniqueness of events. Vedel's research is notable for skillfully using **natural experiments, difference-in-differences (DiD), event studies, and instrumental variables (IV)** in historical contexts – thereby helping to close the gap between empirical economics methods and historical analysis. For example, *A Perfect Storm* is essentially a **natural experiment / DiD** design: the 1825 storm is treated as a random “treatment” of improved geography for one region, and by comparing its trajectory to similar regions without the treatment, Vedel can infer causality ³. He even bolsters this with a *placebo* or *mirror* experiment (the medieval closure) to validate that the mechanism works in reverse too ⁴. This approach brings a level of rigor to historical analysis that

was once thought impossible for events so far in the past. Similarly, the Danish-American church split study explicitly uses a **difference-in-differences setting** – before vs. after 1883, in counties with “Happy” vs. “Holy” Danish churches – to isolate the effect of the religious division on assimilation outcomes ¹². The authors carefully argue that, absent the religious schism, these immigrant communities were on parallel trends (indeed, the Danish immigrants were a relatively homogeneous group initially) ¹¹, making the DiD logic plausible. In *Milk Wars* (Irish cooperatives), Vedel and co-authors deploy an **instrumental variable (IV)** – using historical dairy specialization as an instrument for where cooperatives took root – to address concerns that conflict areas might not be randomly assigned ²⁹. This strengthens the claim of causality between co-op presence and violence ²¹. And in the *energy shocks* paper, an **event study** framework is used, examining firm productivity before, during, and after the coal crisis, with distance to peat as the key interacting variable ¹⁰. By applying these methods, Vedel fills the gap of **how to make credible causal statements in historical studies** – a gap that earlier generations of economic historians could only patch with qualitative reasoning. His work exemplifies how careful research design (finding the right historical episodes that approximate random assignment) combined with rigorous statistical analysis can yield insights that approach the standards of evidence in experimental sciences. This integration of causal inference is raising the bar for economic history research generally, making the field’s conclusions more convincing.

On the **machine learning** front, we have already noted OccCANINE as a significant integration of ML into economic history. It’s worth emphasizing how novel this is: training a transformer model for a historical classification task indicates that economic historians are not just passive consumers of others’ datasets, but are now creators of computational tools tailored to historical data. Additionally, Vedel’s use of **NLP (natural language processing)** for newspapers or the possibility of using name frequency algorithms (some assimilation studies use algorithms to classify names by ethnicity) shows a comfort with modern computational techniques. This helps close the methodological gap where some historical questions were hard to quantify; now, with ML and NLP, even qualitative aspects (like the text of a newspaper article or the ethnic origin of a name) can be systematically analyzed.

Challenges Remaining and Vedel’s Contributions: Despite these advances, certain methodological challenges persist in the field. Data coverage is still uneven (many regions and periods lack the kind of records Denmark had). Causal inference is not always possible for one-off events (not every historical change has a neat comparison group). And not all historians are trained in ML or econometrics, raising the issue of capacity building and collaboration. However, the trajectory of work by scholars like Vedel is clearly helping narrow these gaps. By demonstrating successful examples of *how* to do it, his research encourages further replication and extension. For instance, OccCANINE’s success might inspire similar ML tools for other classification problems (say, classifying commodities or diseases in historical data). The data infrastructure built (like the cooperative creameries database) sets a precedent for other countries’ historians to do the same with their industry archives. Moreover, Vedel’s practice of sharing data and code (his papers’ replication files are on GitHub ³⁰, and OccCANINE is open-source on GitHub ³¹) is an important contribution to the **open science** aspect of methodology.

In summary, Christian Vedel’s work significantly connects to the methodological evolution of economic history. He has helped overcome data scarcity by assembling new datasets, improved measurement through standardization and creative proxies, and embraced cutting-edge analytical tools from machine learning to causal inference. Each of his projects not only produces substantive historical findings, but also serves as a **methodological case study** in doing economic history in the 21st century. By introducing tools like OccCANINE ²⁵ and employing rigorous designs, Vedel’s research challenges the notion that economic

history is limited by poor data or antiquated methods. Instead, it showcases a field that is dynamically integrating new techniques to answer old questions more convincingly than ever.

Conclusion: Illuminating Big Questions Through Vedel's Work

The biggest open questions in economic history – from the deep determinants of development to the mysteries of why and how economies change – require a combination of sound theory, careful empirical work, and innovative methods to answer. In each domain, Christian Vedel's research provides illuminating examples of progress. On the theoretical side, his studies on geography, institutions, and culture provide concrete evidence that advances debates on what drives prosperity (showing geography's potency ³, the contingency of cultural impacts ¹³, and the interaction of factors). Regarding empirical puzzles, his focused historical analyses (of the Limfjord breach, the cooperative movement, immigration assimilation, and energy shocks) have solved specific riddles – often with implications that challenge prevailing narratives (e.g. cooperation isn't always socially benign ²¹, or religious unity can economically cost productivity ¹³). Methodologically, by expanding data frontiers and adopting cutting-edge tools, he and his co-authors are closing gaps that once hindered quantitative historical research.

In doing so, Vedel's work both confirms and questions existing narratives. For example, it **confirms** the long-suspected importance of geography with rare precision (vindicating scholars like Jeffrey Sachs who argued geography matters, by providing a clear case where it did) ³. It also **confirms** the success story of Danish cooperatives in raising productivity, while adding nuance about regional variation ¹⁷. On the other hand, it **challenges** narratives such as the uncomplicated benefit of social capital: in Ireland, social capital in the form of cooperation had a dark side, fueling conflict when colliding with private interests ¹⁹. It also complicates the Weberian idea that Protestant fervor is economically favorable, by showing a devout movement that impeded industrial efficiency in Denmark ¹³. These contributions show that history's lessons are often complex – small differences in context lead to different outcomes.

Ultimately, the overview of open questions presented here demonstrates that economic history is tackling grand questions about why economies evolve as they do. The work of researchers like Christian Vedel is integral to this endeavor: by blending creative historical inquiry with modern empirical methods, his research connects the dots between theory, evidence, and methodology. Each study he conducts not only answers a piece of a historical puzzle but also provides tools or inspiration for answering many more. In that sense, his work on geography, cooperatives, cultural assimilation, and methodology is helping to push the frontier of economic history, bringing us closer to answering those “biggest open questions” with clarity and confidence.

Sources:

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- Relevant literature on big economic history debates, e.g. Acemoglu et al. (2001), Rodrik et al. (2004) on institutions vs. geography ¹; Henderson et al. (2018) on geographic factors ²; Ketterer & Rodríguez-Pose (2018) on European regional growth drivers ²; and comparative views on the Industrial Revolution by Mokyr (2009) and Allen (2009) ⁷ ⁸, have been cited to situate Vedel's contributions in context.

¹ ² ⁶ ³⁰ A perfect storm: First-nature geography and economic development

<https://www.econstor.eu/bitstream/10419/301128/1/1898602212.pdf>

³ ⁴ talks.cam : A Perfect Storm: First-Nature Geography and Economic Development

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<https://sites.google.com/view/christianvedel>

⁷ ⁸ The Industrial Revolution and Modern Development | The Growth Economics Blog

<https://growthecon.wordpress.com/2015/01/13/the-industrial-revolution-and-modern-development/>

⁹ ¹⁰ Adaptability, Diversification, and Energy Shocks: A Firm Level Productivity Analysis by Sofia

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19 21 29 Milk Wars: Cooperation, Contestation, Conflict and the Irish War of Independence
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25 26 [2402.13604] 1 Introduction
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