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Summaries of Doctoral Dissertations

The Dissertations of Michael Jeffrey Andrews, Gillian Michele Brunet, and Colin Russell Weiss: 2018 Allan Nevins Prize Competition of the Economic History Association

and

The Dissertations of Eduardo Montero, Erik Prawitz, and Kilan Rieder: 2018 Alexander Gerschenkron Prize Competition

Every year, there is a special moment at the Economic History Association meetings, when we convene to welcome and learn from the new scholars in our field. It is a unique rite that strengthens our community, and highlights that our field is particularly embracing of this peculiar process of creative destruction, as we celebrate new work that often challenges our priors and beliefs. It is a great honor to present the candidates for the 2018 Nevins Prize.

Though I always look forward to this event as a participant, I must admit that convening the dissertation panel has been a daunting, humbling, and exhilarating exercise. I received 14 submissions for the prize. Of these, 60 percent dealt with diverse issues in macroeconomics, business, and financial history, while the remaining covered various other areas, such as labor, health, and income inequality. The submissions were strong works of economic history. Many of them boldly challenge existing knowledge. I commend the resourcefulness, dedication, and insights of these promising young scholars. The depth of the dissertations made my decision a very difficult one, but it has filled me with joy at the bright prospects of our field.

The three worthy finalists have each written works that make substantial contributions to American economic history, but also to economics more broadly. They ask grand and difficult questions, and they use the full arsenal of tools at their disposal to answer them as best as possible. They do prodigious work with primary sources, use state-of-the-art methods to analyze the data, and rely on narrative histories to guide their analysis. I cannot do their work justice in a short amount of time, but I encourage you all to spend a few enjoyable and instructive hours reading their research to fully appreciate it.

MICHAEL JEFFREY ANDREWS

What drives innovation, and what drives individuals to become inventors? Though scholars have long strived to understand the process of innovative activity, in recent years improvements in text recognition technologies and data availability have reinvigorated the use of patent records to study the causes and consequences of innovation in the American economy over the long run. Michael Andrews' dissertation constitutes a strong addition to this new wave of work.

Ideas can emerge and spread through various channels, including formal education and informal social interactions. Andrews' dissertation exploits two quasi-natural experiments to suggest that both mechanisms played a significant role in the creation of knowledge during the nineteenth and twentieth century United States. He has also done a tremendous amount of data work.

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To address the role of formal education, Andrews studies the establishment of new colleges in the United States from 1839 to 1954, a period that saw an explosion in the number of institutions of higher education. Often, several places were considered as a possible location for a given college. A careful exploration of the narrative historical record is used to determine losing sites that were strong contenders but ended up not being chosen as the location for a new college for arguably exogenous reason. This is impressive, meticulously researched work—the appendix contains about 140 pages of descriptions of the site selection process for over 200 colleges. These institutional histories are fascinating to read. Andrews uses them to guide the selection of losing sites that can serve in the empirical analysis as appropriate controls for winning sites. The identification strategy is reminiscent of Michael Greenstone, Richard Hornbeck, and Enrico Moretti's (2010) work on agglomeration spillovers in manufacturing, and expands Shawn Kantor and Alexander Whalley's (2014) study of land grant colleges to a broader set of institutions.

A comparison of winning and losing sites reveals that the establishment of a college increases the number of patents in that county, and it also has positive spillover effects on patenting activity in neighboring countries. Andrews then wonders whether the effects of colleges on local innovation are direct or indirect. Are the students and professors affiliated with the educational institution creating the patentable new knowledge, or are county residents who are not themselves affiliated with the college those primarily responsible for the rise in innovation? Answering this question presents a clear data challenge. Andrews cleverly matches patent records to college yearbooks from 1900 to 1940 to determine whether innovators studied or taught at particular institutions.

It turns out that students and professors did not innovate that much, at least while they remained in the county where the college was located—it is possible, however, that individuals affiliated with the college moved and innovated elsewhere. Instead, the establishment of a new college appears to have had an indirect impact on innovation, leading county residents unaffiliated with the educational institution to patent more. To further convince us of this indirect channel, Andrews asks a simple, but clever question. Were those individuals that were restricted from attending the college likely to innovate more after it was established? He shows that, indeed, patenting rates by blacks and women increased differentially in winning counties. (These types of simple but illuminating comparisons, by the way, are what sets Andrews' work apart.) I was left wanting to know more, however, about the ways in which the innovative process of individuals unaffiliated with the educational institution may have benefited from the nearby college.

The differences in patenting activity between winning and losing counties were somewhat persistent, and it is easy to see why. Once a college was established, the county exhibited much faster population growth than other close by areas. Andrews speculates that colleges may attract particularly high skilled or creative individuals to the area, and create knowledge spillovers. This seems plausible, but it requires further examination. In a different chapter, Andrews amasses a wealth of data on inventors' demographics. I wish these data were put to use here, to learn more about those inventors who may have moved into the county, and about those students or professors who may have moved away and innovated elsewhere. More generally, the main results in the paper are not always as strong or consistent as I would have hoped for.

Determining the role of informal social connections on innovation requires a fair amount of creativity. How do we know whether people interact in an informal setting? We often observe whether individuals are co-workers or classmates, but firms and

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schools may themselves directly affect ideas, even if employees or students do not interact with each other. It is also difficult to think of a shock to social networks that changes little else. To overcome these empirical challenges, Andrews studies the introduction of state-level alcohol prohibition in the United States in the first two decades of the twentieth century.

Counties that were wet prior to the enactment of statewide prohibition were forced to shut down saloons, where individuals got together to drink, socialize, and, presumably, share ideas. The imposition of statewide prohibition resulted in a differential decline in patenting rates in wet counties relative to dry counties. A creative piece of validating evidence is to compare patenting activity by gender. Since women were typically not welcome to frequent saloons, their ability to innovate should have been less affected by the laws. Indeed, Andrews shows that the difference in patenting rates between men and women was reduced after the imposition of prohibition. This paper suggests that informal social interactions may constitute an important channel for the diffusion of ideas, at least in the short run. Andrews finds that patenting in formerly wet countries recovered its initial level in about five years of the imposition of statewide prohibition, suggesting that individuals may have found new venues to exchange ideas over time.

I would also like to call attention to another chapter, co-written with Nicholas Ziebarth, which makes a large data contribution to a topic that has long interested economic historians—who were the innovators of the past? This chapter expands on the work by Naomi Lamoreaux and Kenneth Sokoloff (2005) on inventors' backgrounds by taking advantage of the current abundance of digitalized records. Specifically, people who were granted a patent in Census years from 1870 to 1940 are matched to the corresponding decennial U.S. Population Census, providing demographic information for almost 50,000 inventors. Inventors were quite different from the general population—they were more likely to be white, male, and, perhaps, more mobile geographically. The facts turn out not to be very surprising and attempts to relate local economic factors to the demographics of patentees are inconclusive, but the data are really fascinating. I expect that, along with a similar dataset constructed by Ufuk Akcigit, John Grigsby, and Tom Nicholas (2017), these data will be much used in coming years to expand our knowledge of the American creative process over the long run.

GILLIAN MICHELE BRUNET

The global recession of 2008 and the resulting fiscal stimulus packages in many countries have reignited academic interest in government spending multipliers. Despite a growing theoretical and empirical literature, there is little consensus on the impact of government spending on macroeconomic aggregates—a recent paper, for example, upliftingly characterized this debate as the "fiscal multiplier morass" (Leeper, Traum, and Walker, 2017). Gillian Brunet's dissertation makes significant contributions to this contested literature by focusing on the largest fiscal shock in modern American history—WWII. Besides providing novel estimates of the fiscal multiplier during the war period, her work also seeks to understand how the economic and institutional contexts affect this important statistic.

To estimate the fiscal multiplier, Brunet focuses on military spending, a standard practice to address the endogenous response of other forms of government spending to the economic cycle. A naïve guess would suggest a large multiplier for the war period—defense spending was never as large as a fraction of GDP, and economic growth also

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peaked at that time. But the work by Robert Higgs (1992) and, more recently, Price Fishback and Joseph Cullen (2013), who find small effects of war production spending on retail activity at the county level, suggest that this may not be the case. Using new data and a state-of-the-art methodology, Brunet indeed estimates a relatively small multiplier for the war years.

This chapter of Brunet's dissertation is a bit of a tour de force. It uses a novel dataset of government war supply contracts with private firms to construct a state-level panel data on war spending from 1940 to 1945—over 190,000 contracts worth about almost twice American GDP in 1940. Her approach is to estimate the relative effect of spending shocks across states—what is called the open economy relative multiplier—and then relate this multiplier to the aggregate multiplier as in Emi Nakamura and Jón Steinsson (2014). She then uses case studies and narrative evidence to guide the evaluation of the mechanisms that may explain the relatively small relative multiplier. And as in the rest of the dissertation, much thought goes to determining the most appropriate unit of analysis for the research question at hand.

The effects of war production spending on wartime employment and income appear to have been quite modest—only about one quarter the size of similar estimates for the post-war period (Nakamura and Steinsson, 2014). Why would the multiplier be so low given the large scale of war production? The war period was also extremely unusual. The demand for war-related products required large-scale conversion of industrial capacity. Non-war industrial production contracted even as total production soared. Personal saving rates also skyrocketed, perhaps due to a combination of patriotic efforts to help finance the war, the rationing of durable goods, and the high levels of public debt. While savings rates increased throughout the United States, they did so by more in states that received more war spending. Brunet's work therefore suggests that there may be diminishing returns to the fiscal multiplier process: once the scale of a government spending shock grows to a sufficiently large size relative to the aggregate economy, it displaces other economic activity, attenuating its impact on aggregate employment and incomes.

If I had to come up with criticisms to this otherwise fine work, I would urge the author to further exploit the richness of the data. For example, the detailed war contract data is primarily used to get at the timing of spending, but any differential effects across manufacturing products get lost in the aggregation.

If rationing, the conversion of production, and high savings reduced consumption during the war differentially in areas that received more defense spending, then it is possible that household spending increased when these constraints were lifted after the war ended. A second chapter in Brunet's dissertation therefore switches the focus to the post-war years. Aggregating defense spending to commuting zones to more accurately capture local labor markets, she finds that locations receiving more war spending increased the purchases of durable goods by more following the war, but that there were no differential effects on retail sales, a proxy for consumption in non-durable goods.

The post-war increase in consumption suggests that a fiscal multiplier that takes into account dynamic effects may improve our assessment of the effects of government spending during the war on the economy. This may be a worthwhile exercise to consider. I also wonder about the effects that the end of the war had on firms. Those firms receiving contracts had to reconvert after the war ended, and this process may have affected firm investment, at least in the short run. Access to credit for small firms and households may also have improved when the crowding out effects created by high

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levels of government debt diminished. Overall, however, Brunet makes a convincing case that wartime spending may have contributed to American prosperity in the post-war period.

In a different paper, Brunet joins a long tradition in economic history—that of providing new measurement of economically significant variables. Specifically, she proposes a novel measure of government spending, budget authority, which takes spending into account when it is authorized, before funds are dispersed. This approach differs from existing measures—such as those based on National Product Income Accounts data or on a narrative approach, as in Valerie Ramey (2011)—by how it captures the timing of spending or expectations about future spending. She shows that the aggregate fiscal multiplier is quite sensitive to the choice of measure. I found this exercise somewhat less persuasive. Budget authority implicitly assumes that households and firms would wait until any uncertainty about future government spending is resolved, which does not seem an accurate description of the expectation formation for most economic agents.

COLIN RUSSELL WEISS

Economic uncertainty plays a central role in macroeconomic models. Traditionally, researchers have used various aggregate economic indicators, such as the volatility of stock market returns, to quantify economic uncertainty. But these indicators may in turn be influenced by a variety of factors that also affect economic activity. In recent years, researchers have instead followed a narrative approach. Introduced by Christina Romer and David Romer (1989, 2004), this approach utilizes the historical record (for example, narrative accounts of the process that led to various government decisions) to identify shocks to policy. More recently, the increasing availability of data and machine-learning methods have led researchers to measure fluctuations in policy uncertainty based on the frequency of uncertainty-related terms in newspaper articles (Baker, Bloom, and Davis, 2016). This strategy is particularly useful for economic historians, as newspapers are often available over a long time span and for a large set of countries.

Empirical attempts to determine whether and how economic policy uncertainty has real economic consequences have been less successful, in no small part because these attempts have tried to encompass many kinds of economic policies over a long period across many countries (see for example, Baker, Bloom, and Terry, 2018). Weiss makes a significant contribution to this growing literature by following a more focused approach (see Baker, Frydman, and Hilt, 2018, for a similar approach). He studies one particular source of policy uncertainty, devaluation risk, during a specific and historically relevant period: the "Free Silver" movement in the late nineteenth century United States. This approach allows him to make more convincing claims on identification. Fluctuations in exchange rate risk often occur at times of economic turmoil, muddling the attribution of any economic effects to this specific source of risk. "Silver agitation" heightened fears that the United States would abandon the gold standard and substantially depreciate the dollar, but this never happened. The silver question was, without a doubt, one of the major sources of policy uncertainty at that time, and it clearly dominated the political debate. Politics, more than economic factors, were the more likely cause of devaluation risk.

Weiss focuses on the effects of uncertainty on financial markets and industrial production from 1878 to 1900. He constructs a daily series of silver coinage policy news shocks based on information from the historical financial press, and links it to daily

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bond yields. Corporations often issued corporate bonds payable in "gold coin" rather than dollars, making their debt burdens highly sensitive to devaluation risk. One would therefore expect currency risk to differentially affect firms by their credit risk. To sort corporate debt into safe and speculative securities, Weiss constructs his own measure of credit risk, utilizing the criteria that Moody's introduced decades later to rate securities, and applying it to hand-collected firm financial information. The amount of new data collected for this project is just astounding.

News of reduced silver coinage risk indeed lowered the safe-speculative bond spread. Further analysis suggests that the impact on bond risk premia was largely attributable to the increase in the firms' likelihood to default in the case of devaluation. An impulse-response analysis also finds that changes in exchange rate expectations had sizable and persistent effects on aggregate industrial production. Weiss' work therefore provides a convincing link between policy uncertainty and real economic activity.

Though I find each of these pieces of evidence persuasive on their own, there is a bit of disconnect between them. Bond spreads and credit risk can only be calculated for railroads, which were the primary issuers of corporate debt at that time. Instead, industrial production also reflected the impact on other industries (see Davis, 2004). Relative to railroads, industrial firms had much lower leverage levels, suggesting that default risk may have played a lesser role for them. Perhaps demand for their goods was reduced at times of higher uncertainty. It would be helpful to investigate the channels by which devaluation risk affected industrial production more broadly.

The threat of a bimetallic system largely died out with the election of President McKinley, who was a staunch supporter of the gold standard, in 1896. This event gives Weiss a unique opportunity to study how the resolution of policy uncertainty affects firm outcomes. He finds that those railroads more sensitive to currency risk experienced greater growth in their net income in the year following the election relative to less affected railroads. Interestingly, investment did not respond differentially. Instead, railroads utilized the additional income to pay dividends, perhaps as a result of the hardships they had suffered during the Panic of 1893. In the aftermath of this severe crisis, when a quarter of the country's railroads went into distress, the market for corporate bonds, which were the main source of railroad finance, continued to be sluggish. But the resolution of uncertainty strengthened the conditions of the banking system, which in turn may have improved general economic activity. Weiss argues that policy uncertainty had an indirect effect on railroads, by influencing the demand for their services.

It is unfortunate for the analysis, though perhaps not coincidental, that the Panic of 1893 took place just a few years prior to McKinley's accession to the Presidency. The railroad industry continued to be severely disrupted in 1896. These firms also suffered major transformations—their corporate governance, for example, radically changed as bankers took on board seats in exchange for helping with corporate restructuring. It is quite possible that the resolution of economic policy uncertainty would have very different impact on firm outcomes during a more robust period for the industry.

The last chapter of the dissertation uses the period of silver coinage agitation to study how newspapers use bias in economic reporting. In response to increased policy uncertainty, newspapers printed more articles using biased phrases regarding the monetary standard. This increase in media slant occurred primarily during election campaigns but was not equally salient during legislative discussions regarding monetary policy. A novel takeaway of the paper is therefore that the electoral process plays an important

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role in the media's reporting on economic policy. The chapter also offers preliminary evidence to suggest that biased reporting actually influences the partisanship of politicians. Given the increased polarization in modern politics and media coverage, this is a topic ripe for further exploration.

Carola Frydman, *Northwestern University*
Mark Koyama, *George Mason University*

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Fuel of Interest and Fire of Genius: Essays on the Economic History of Innovation

The title of this dissertation comes from a lecture Abraham Lincoln delivered in 1859.[1] While not known as one of Lincoln's more eloquent addresses, the lecture does contain a few quotable lines, including its famous conclusion: "The patent system…secured to the inventor, for a limited time, the exclusive use of his invention; and thereby added the fuel of interest to the fire of genius, in the discovery and production of new and useful things." Economic historians have spent considerable time investigating "the fuel of interest." For just a few examples, Petra Moser (2005) and Tom Nicholas (2011) show how the structure of the patent system affects the rate and direction of invention, while recent work like W. Walker Hanlon (2015) and Reka Juhasz (2018) explores the role of factor prices or market size. But far less is known about the second half of Lincoln's dichotomy. Keeping the incentives to invent fixed, who is likely to become an inventor? How do creative individuals come up with ideas? And, if I may extend Lincoln's metaphor, what types of policies fan the flames of genius, and which throw cold water on them?

My dissertation makes use of large-scale historical patent datasets to address these questions. I thus build on earlier work attempting to study the fire of genius, in particular foundational work by Kenneth Sokoloff and coauthors, for example, Sokoloff and B. Zorina Khan (1990), Khan and Sokoloff (1993), Naomi Lamoreaux, Sokoloff, and Dhanoos Sutthiphisal (2013).

In Chapter 1 of the dissertation, I study how colleges affect local invention.[2] This is typically a difficult question to answer, for the simple reason that colleges are not located randomly. The direction of the bias is also unclear: colleges may locate in up-and-coming towns or, just as likely, may opt to locate in quiet locations away from urban distractions. The location may furthermore depend on other factors like geographic centrality that are correlated with invention in difficult-to-determine ways. To overcome this challenge, I identify "runner-up sites." These are locations that were strongly considered to become the site of a new college, but were ultimately not selected for essentially random reasons. This is similar to the approach employed in Michael Greenstone, Richard Hornbeck, and Enrico Moretti (2010) to find candidate locations for large manufacturing plants. I end up with runner-up locations for 72 U.S. colleges established from the mid-nineteenth to mid-twentieth centuries. I show that the winning college site and the runner-up locations are similar along observable dimensions. I then use patent data from 1836–2010, described in Chapter 4 later, and a differences-in-differences framework to observe how patenting changes in the college counties relative to the runners-up before and after establishing a new college. I find that establishing a

Michael J. Andrews, Postdoctoral Fellow in Innovation Policy, National Bureau of Economic Research. E-mail: mandrews@nber.org. This dissertation was completed at the University of Iowa under the supervision of Nicolas L. Ziebarth (chair) and Joel Mokyr. I am grateful to the Ewing Marion Kauffman Foundation, NSF Doctoral Dissertation Grant #1661421, the Balzan Foundation, and the Northwestern Center for Economic History for financial support.

[1] The lecture met with decidedly mixed reviews. In fact, there is speculation that the lecture was so tepidly received that Lincoln gave up on his career as a full-time lecturer and returned to politics (Emerson 2009).

[2] I refer to all institutions of higher education as "colleges" throughout.

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new college causes about 38 percent more patents per year in the counties that receive a college. The runner-up methodology is crucial: I show that the local effect of colleges is greatly overstated when also considering cases in which the college site is not determined at random.

I next investigate the channels through which colleges cause this increase in local patenting. Do colleges primarily operate through direct channels, producing human capital for alumni and research from faculty, or though indirect channels, such as operating as anchor institutions to attract population? To answer this, I build a novel dataset of historical college yearbooks that include information on students and faculty for about one-third of the colleges in my sample for 1879–1940. I then match by name from the patent record to the yearbooks. Only 5 percent of the patents in college counties come from alumni or faculty of that college. The rest come from individuals who have no affiliation with the college. Seventy-five percent of patents come from individuals who were not living in the college county at the time the college was established. This suggests that the predominant way in which colleges affect local invention is through attracting population. If, indeed, this is the main channel, then it raises the question of whether colleges are a necessary condition to promote local invention. To check this, I examine cases in which the runner-up counties receive other types of institutions, such as state prisons or insane asylums. While these institutions do not produce the direct effects that colleges do, training students or conducting research, they do attract population similarly to colleges and, in fact, cause an increase in patenting statistically indistinguishable from that caused by colleges. This further supports the hypothesis that colleges' primary effect on local invention is through increasing local population. One important caveat is that these results only show the effect of colleges on *local* invention; in future work I intend to track alumni across time and space to gain insight into the effect of college expansion on national patenting.

While the results in Chapter 1 tell us something about the identities of inventors in college counties, it would be nice to have a picture of the American inventor more generally. The patent record itself contains inventors' names and places of residence, but is silent on issues of inventor demographics. In Chapter 2, Sarada, Nicolas L. Ziebarth, and I match patents from the Annual Reports of the Commissioner of Patents from 1870 to 1940 to the corresponding U.S. decennial population censuses. We show, not surprisingly, that women and blacks are underrepresented in patenting. What is striking is that this underrepresentation is highly persistent, even over periods of time when these groups saw radical changes in their social, cultural, economic, and educational environments. For example, we document that female patenting rates are no higher in areas that adopt women's suffrage earlier, and places that get historically black colleges and universities do not see gains in black patenting that cannot be explained by increases in the black population. We also document that inventors are older than the average population of the counties in which they reside, at about 40 years old, and that 60–75 percent invent in a state other than the one where they were born.

In Chapter 3, I further investigate the conclusions of Chapter 1 that increasing population, possibly due to increasing density and knowledge spillovers, is important for invention. More specifically, I examine the importance of informal social interactions for the creation of new ideas. This topic is typically difficult to study rigorously, as informal interactions suffer from a fundamental endogeneity problem: people choose who they talk to. To overcome this, I exploit another historical natural experiment in which the state shuts down channels of informal social interaction: state-level alcohol

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prohibition laws, typically passed by referendum in the decades leading up to national prohibition in 1920. I compare counties that were wet for long periods of time prior to the establishment of prohibition and voted to remain wet, so that prohibition is imposed by the state and is not caused by changing county-level attitudes towards alcohol, which may be related to other unobservables that could affect patenting. Using patent data from Sergio Petralia, Pierre-Alexandre Balland, and David L. Rigby (2016) described later, I find that prohibition causes a roughly 20 percent decline in patenting. The drop is largest in the three years following prohibition and largely rebounds within five years, which is to be expected if the drop is caused by a shock to social networks and individuals can reconstruct these networks in other venues over time. Consistent with the effect being driven by a disruption of social interactions, I find that after prohibition co-patenting rates decline, the diversity of inventions declines, and the drop is larger for first-time relative to serial inventors. As a placebo test, I show that the decline is only observed for male patentees, as expected since women were not typically welcome in saloons to begin with. Exploiting variation in state-level prohibition laws, I present suggestive evidence that the drop is not driven by access to alcohol per se, but rather to the social interactions that the saloon helped to facilitate.

Of course, all of the conclusions from the above chapters are only as credible as the patent data used to draw them. In Chapter 4, I discuss in detail the strengths and weaknesses of several historical patent datasets. I consider four sets of patent microdata: the Annual Reports of the Commissioner of Patents from 1870–1940; the "HistPat" dataset constructed by Petralia, Balland, and Rigby (2016) using Google Patents and covering the years 1836–1973; the Subject-Matter Index of Patents for Inventions issued by the USPTO in 1874 and covering all patents issued from 1790–1873, transcribed by Dr. Jim Shaw of Hutchinson, KS; and the USPTO Historical Patent Masterfile (Marco, Carley, Jackson, et al. 2015), which contains all known patents issued from 1790–2014.

I use all four datasets for Chapter 1 of my dissertation; the Annual Reports form the basis for Chapter 2, while HistPat is used in Chapter 3. Each dataset provides different information about the patents they contain, as well as idiosyncratic errors and omissions and different coverage of years. A particular dataset may therefore be more or less suitable for a given application. In aggregate, the datasets paint a remarkably consistent picture of the history of U.S. invention, but there are some important differences. For instance, the HistPat data, which uses machine learning to infer a patent's location, overstates the share of invention occurring in large cities relative to the Annual Reports data. I show that multiple datasets can be used in conjunction with one another to improve inference. It is my hope that this analysis will prove useful to other economists interested in using historical patent data, but do not know which of the available datasets to use and wish to avoid "reinventing the wheel" by building a large dataset from scratch.

In all, these chapters use large-scale patent data and historical natural experiments to better understand "the fire of genius." The findings especially highlight the importance of population size and informal interactions for the production of inventions. I also provide a better understanding of the existing historical patent data, which may help facilitate continued investigation of the inventive process.

MICHAEL J. ANDREWS, *National Bureau of Economic Research*

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Understanding the Effects of Fiscal Policy: Measurement, Mechanisms, and Lessons from History

A key question in macroeconomics is the influence of fiscal policy on aggregate economic activity. How much economic activity results when the government increases spending by one dollar, and how does the economic and institutional context affect the answer to that question? My dissertation uses a variety of empirical techniques to explore aspects of this question using historical data on U.S. military spending.

Gillian Michele Brunet, Assistant Professor of Economics, Wesleyan University. E-mail: gbrunet@wesleyan.edu. This dissertation was completed under the supervision of Christina Romer (chair), Barry Eichengreen, Yuriy Gorodnichenko, and Noam Yuchtman at the University of California, Berkeley.

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In Chapter 1 I use state-level variation in war production spending to measure the fiscal multiplier during WWII and examine how features of the wartime economy influenced the size of the fiscal multiplier. Chapter 2 focuses on how the measurement of government spending influences the estimated size of the multiplier. I introduce a new time series measure of aggregate defense spending. In Chapter 3 I return to WWII, but this time examine the effects of wartime military spending on the post-war economy, exploring the war's role in driving the immediate post-war boom.

STIMULUS ON THE HOME FRONT: THE STATE-LEVEL EFFECTS OF WWII SPENDING

WWII is viewed as the quintessential example of fiscal stimulus and exerts an outsized influence on fiscal multiplier estimates, but the economic history literature does not support this interpretation. Price Fishback and Joseph A. Cullen (2013) find that total war production spending had no influence on growth in county-level retail sales between 1939 and 1948. Robert Higgs (1992) does not directly address the economic effects of wartime spending but challenges the notion of wartime prosperity based on how much of the wartime growth in both output and employment was directly attributable to war production and consequently did not contribute to civilian economic wellbeing. In Chapter 1 I provide new evidence on the effects of government spending in WWII and confirm that the multiplier was indeed quite small during this period. I then show that features of the wartime economy explain the small wartime multiplier.

I use newly-digitized contract data[1] to construct a state-level panel on U.S. military spending in WWII, allowing me to produce the first panel-data estimates of the relative fiscal multiplier for this period. Using an estimation technique similar to that used by Emi Nakamura and Jón Steinsson (2014) with modern military spending data, I estimate a relative fiscal multiplier of 0.25, implying an aggregate multiplier of roughly 0.3. This finding stands in stark contrast to Nakamura and Steinsson's relative multiplier estimate of 1.4 for 1966 to 2006.

Employment effects were also small in WWII, consistent with the finding of a small wartime fiscal multiplier. The implied cost of each additional job year was the equivalent of $165,000 to $255,000 of military spending in 2015 dollars. In contrast, employment estimates for the 2009 American Recovery and Reinvestment Act (ARRA) imply a range of costs per job year of $22,000 to $170,000 per job year.[2]

Unique features of the wartime economy significantly reduced the stimulative effect of wartime spending. Conversion from civilian manufacturing to war production reduced the initial shock to economic activity because war production directly displaced civilian manufacturing. Entire industries switched from civilian manufacturing to war production, most famously the automobile industry. I find that roughly $1 out of every $3 spent on war production directly displaced civilian manufacturing, so the net shock to economic activity was much smaller than the amount spent.

Another feature of the wartime economy also contributed to the unusually low fiscal multiplier: private savings skyrocketed during the war. Because of conversion, consumer

[1] Civilian Production Administration. *Alphabetic listing of major war supply contracts: cumulative June 1940 through September 1945*, 1946.

[2] See Chodorow-Reich, Feiveson, Liscow, et al. (2012), Feyrer and Sacerdote (2011), Shoag (2013), and Wilson (2012) for estimates of the employment effects of ARRA.

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durables were not available for households to buy. In this sense conversion is closely related to rationing. Data limitations make it impossible to measure wartime household consumption directly at the state level. However, I approach the question indirectly by constructing state-level measures of household saving. I digitized state-level data on Series E war bond purchases from the *Monthly Treasury Bulletins*[3] and constructed net bank deposit flows using the *Reports of the Comptroller of the Currency*.[4] Together, war bond purchases and bank deposit flows account for about 60 percent of the income response to war spending. This implies an upper bound on the consumption response to war spending, helping explain why the wartime fiscal multiplier was so much smaller than the fiscal multiplier for later periods.

Together, conversion and the high wartime saving rate explain about half the difference between Nakamura and Steinsson's relative multiplier estimate of 1.4 for the postwar period and my estimate of 0.25 for WWII. My findings imply that the wartime boom of the early 1940s reflects the massive scale of the war effort, not that war production was a particularly effective form of stimulus.

WHEN DOES GOVERNMENT SPENDING MATTER?

Chapter 2 focuses on how the measurement of government spending influences the estimated fiscal multiplier. There are two major puzzles in the fiscal multiplier literature. First, empirical estimates of the cross-sectional (or relative) multiplier on government spending are large relative to estimates of the aggregate multiplier on government spending. This is particularly puzzling given that recent work suggests that in most empirically relevant cases—including under the conditions prevailing in WWII—the cross-sectional multiplier should be a rough *lower* bound for estimates of the aggregate multiplier (Chodorow-Reich forthcoming). Second, estimates of the aggregate multiplier on tax changes are large relative to estimates of the aggregate multiplier on government spending. Again, economic theory suggests that, if anything, the opposite should be the case.

My insight is that these three empirical literatures measure the timing of government spending (and tax cuts) in three different ways since their data are constructed from different sources. Following a long tradition in economic history, I focus on how the measurement of fiscal shocks influences estimates of the multiplier. Government spending involves a long process, not a single development. For this reason, getting the timing right is a non-trivial question.

It is standard in the literature to use the National Income Product Accounts (NIPA) to measure government spending. NIPA measures government spending as the flow of government funds out of the Treasury for spending purposes. For some purposes—such as national income accounting—this measure is ideal. However, if the goal is measuring the influence of government spending on economic activity, I argue that NIPA measures government spending too late in the process. A significant fraction of payments is often

[3] *Treasury Bulletin*. United States Treasury Department, Office of the Secretary, February 1942–August 1947. https://fraser.stlouisfed.org/title/407#!6544 Note: because Series E war bonds could only be purchased by individuals and not by institutional investors, these war bond purchases are additive with bank deposit flows.

[4] Office of the Comptroller of the Currency. *Annual Report of the Comptroller of the Currency*, 1938–1947. https://fraser.stlouisfed.org/title/56#19159

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delayed until final goods are delivered to the government. Specifically, firms are often paid after they have received a contract, hired workers, and purchased materials. These actions initially show up in NIPA as inventory investment on the part of the firms with government contracts. When the firm delivers the finished goods, the NIPA records negative inventory investment and positive government spending.

I introduce an alternative measure of government spending, called *budget authority*, which uses authorizations to measure the government's commitment to spend. Budget authority is established annually as part of the congressional budget process, and is readily available from 1976 onward. I use historical budget publications to construct defense budget authority for 1938 to 1975, extending the available data backwards by several crucial decades. Over time $1 of defense budget authority will eventually translate into $1 of defense spending as measured by NIPA. The main difference between the two measures is their timing.

Measuring government spending with budget authority generally produces larger estimates of the aggregate fiscal multiplier than when NIPA is used. Budget authority also produces far more precise estimates: the standard errors for the multiplier based on budget authority are approximately half those based on the NIPA. The differences between the two measures are largest at shorter time horizons and diminish over longer time horizons—as one would expect since the two measures converge over time. Consumption responds more strongly to defense budget authority than to defense NIPA—suggesting why budget authority produces larger estimates of the aggregate multiplier. Investment also responds far more strongly to budget authority than to NIPA over a one-year time horizon. Together, consumption and investment responses explain why budget authority produces larger estimates of the fiscal multiplier than the more traditional NIPA measure.

AFTER THE WAR: THE EFFECTS OF WARTIME SAVING ON POST-WAR HOUSEHOLD CONSUMPTION AND INVESTMENT

The U.S. economy boomed after WWII, but we know relatively little about the relationship between the war and the postwar boom. Economic historians have previously explored the effects of WWII on the economic development of specific regions, finding evidence that wartime production helped shift economic activity (particularly manufacturing) permanently towards the Pacific coast (Rhode 2003; Wright 2018), but that war spending did not systematically drive southern economic development in the post-war years (Jaworski 2017). Fishback and Cullen (2013) find that counties receiving higher war spending did not exhibit appreciable increases in retail sales (which they interpret as a proxy for income) or in manufacturing wages in 1948 relative to 1939, but that those counties did receive significant population inflows.

In Chapter 3 I examine the influence of WWII on U.S. household consumption and saving in the immediate post-war years—after rationing was relaxed—through the channel of wartime saving. I find evidence that in areas (whether counties or commuting zones) receiving more war spending, households spent more on durables in the immediate post-war years: there is a strong positive association between war spending and the increase from 1940 to 1950 in the fraction of households with modern, private bathrooms. In less rural areas (defined as less rural than the sample median)—places where the relationship between war spending and wartime saving was stronger to begin with—there is also a strong association between war spending and

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the increase from 1940 to 1950 in the fraction of households owning electric refrigerators. Finally, I find that wartime saving is strongly associated with large increases in the number of housing units in an area: a 10 percent increase in wartime saving (war bonds and bank deposits held in 1944) is associated with a 2.6 percent increase in the number of housing units in 1950. While more work remains to be done, this is suggestive evidence that wartime asset accumulation helped fuel the post-war boom.

My dissertation uses economic history to explore the mechanisms of fiscal policy. The resurgence of interest in fiscal policy in the wake of the Great Recession has served to highlight how much we have yet to understand about how fiscal policy affects macroeconomic activity and under what conditions the size of the fiscal multiplier systematically varies. Economic history offers important insights into these empirical questions.

Gillian Michele Brunet, *University of California, Berkeley*

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Free Silver and Financial Frictions

What are the economic effects of political uncertainty? The persistent agitation of the Free Silver movement in the United States in the 1880s and 1890s provides a unique opportunity to study this question. By advocating replacing the gold standard with unlimited bimetallism at a mint price ratio between gold and silver that was often severely misaligned with the market ratio for the two metals, the Free Silver movement created significant exchange rate uncertainty. I focus on the economic costs that this exchange rate uncertainty imposed on the U.S. economy and the role that gold-denominated debts played in transmitting this nominal risk to the real economy. I first study the effects of news about silver coinage policy on corporate bond yields and aggregate industrial production between 1878 and 1900. Next, I examine how the defeat of the Free Silver candidate, William Jennings Bryan, in the 1896 presidential election affected firm-level outcomes in the subsequent years. I conclude by investigating the relationship between this economic policy uncertainty and newspaper bias when reporting on the topic of the gold standard and silver coinage.

I thus contribute to the growing study of the effects of policy uncertainty on real activity, specifically exchange rate risk—a common phenomenon in developing economies.[1] By emphasizing the importance of gold-denominated debt, I also expand the literature studying how foreign currency debts affect the transmission of nominal exchange rate movements.[2] Although they are both important topics for modern policymakers, they are difficult to address with modern data.

SILVER COINAGE NEWS, CORPORATE BOND YIELDS, AND INDUSTRIAL PRODUCTION

Beginning with contemporary opponents of the Free Silver movement, and later by Milton Friedman and Anna Schwartz (1963), many have speculated that the uncertainty created by Free Silver agitation imposed significant real costs on the U.S. economy. In my first chapter, I use the high-frequency (daily) response of corporate bond yields to news about silver coinage policy as an instrument to credibly identify the effects of exchange rate uncertainty on monthly industrial production in order to test the aforementioned hypothesis.

I begin by constructing a series of daily silver policy news shocks between 1878 and 1900 using narrative methods. I look for sharp increases in monthly counts of

Colin Weiss, Economist, Division of International Finance, Board of Governors of the Federal Reserve System, Washington D.C. 20551. E-mail: colin.r.weiss@frb.gov. This dissertation was completed under the supervision of Dora Costa (chair), Leah Boustan, François Geerolf, and Francis Longstaff at the University of California-Los Angeles. The views in this dissertation are solely the responsibility of the author and do not reflect the views of the Board of Governors of the Federal Reserve System or of any other person associated with the Federal Reserve System.

[1] See Baker, Bloom, and Davis (2016) for a summary of the literature on economic policy uncertainty. Mitchener and Weidenmier (2015) study exchange rate uncertainty under the classical gold standard, while Schmukler and Serven (2002) study the imperfect credibility of modern exchange rate pegs.

[2] Recent examples include Kim, Tesar, and Zhang (2015) and Niepmann and Schmidt-Eisenlohr (2017).

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newspaper articles related to silver and then read further to find exact dates when news that altered expectations of future silver coinage arrived. This results in a set of 21 silver policy events.

Next, I hand-collect daily corporate bond prices around these 21 events, as well as for a six-month period in 1891 without silver news. I then match these bonds with hand-collected annual balance sheet and earnings data for the issuing companies. This allows me to assign a measure of credit risk to each bond. Importantly, this aids in identifying the effects of silver news on yields: roughly 70 percent of corporate bonds were payable in gold coin rather than dollars, and bonds with higher credit risk had higher gold debt burdens. Thus, these speculative corporate bonds were more exposed to news about the future dollar-gold exchange rate than safer corporate bonds.

I find in an event study that corporate bond spreads increase by 35 basis points when there is news that raises silver coinage risk. Additionally, the effect of silver policy news increases to 50 basis points after the Panic of 1893, as the ability of the United States to maintain the gold standard was weaker after the panic. These average effects are large when compared to spread changes from other uncertainty shocks of the time as well as to when the United States actually abandoned the gold standard during the Great Depression. Further, individual yield changes on event days are indeed correlated with the bond's gold debt burden, reflecting the importance of currency mismatch as a transmission mechanism.

I take these daily spread changes from silver policy news and use them as shocks to exchange rate expectations for impulse response functions of monthly measures of real activity in the second half of this chapter. I first document that silver news did change exchange rate expectations by estimating an impulse response function for the dollar-gold interest rate differential. This interest rate spread increases immediately in a month where silver risk increases and remains elevated for several months. Turning to the response for real activity, I estimate a statistically and economically significant decline in industrial production as a result of increased silver coinage risk. The 12-month trough of industrial production due to an average increase in credit spreads from heightened silver risk is one-third of the decline in annual industrial production during the Panic of 1893.

I again find evidence that gold debts played an important role in transmitting nominal uncertainty to real activity. Immediately after several decreases in silver coinage risk, the narrative record indicates railroads increased their borrowing for investments as well as their maintenance spending. In addition, as argued by Scott Fulford and Felipe Schwartzman (2019), gold standard uncertainty affects the returns to holding dollar-denominated bank deposits. I present suggestive evidence that the currency-deposit ratio moved in the predicted direction around major silver policy events.

THE 1896 ELECTION AND RAILROAD OUTCOMES

Standard theories of the effects of economic uncertainty predict that, when uncertainty is resolved, a boom in investment occurs. I test this prediction using the aftermath of the 1896 presidential election in my second chapter. The defeat of William Jennings Bryan in this election is widely seen as the effective end to the Free Silver movement. Given that this is a single event, I focus on cross-sectional variation in response to the election. Specifically, I examine whether firms with larger bond yield changes on dates with election news saw bigger changes in earnings and investment after the election.

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I hand-collect annual operations and balance sheet data for 81 railroads between 1890 and 1900 for this study. Railroads were the primary issuers of traded bonds at the time and also had the most uniform reporting of their operations and balance sheet data. I study the effect of the 1896 election on railroads' net income, maintenance spending, and investment, as well the composition of their liabilities (debt versus equity). The yield changes from election news are based on the events related to the 1896 election classified in my first chapter.

Greater yield changes from election news predict greater growth in net income and maintenance spending after the election, but investment spending is not related to the sensitivity of bond yields to election news. While changes in borrowing costs (proxied by bond yields) should be most directly related to investment spending among firm outcomes, I argue that this does not happen with 1896 election news because those firms with the greatest yield changes happened to have the weakest financial conditions prior to the election. Importantly, a significant predictor of investment spending after the election is the firm's ability to service its existing debts before 1896. I also present narrative evidence of financial constraints for several firms with large increases in earnings after the election that did not significantly increase investment.

The relationship between yield changes and income growth is less direct, but I provide evidence favoring a specific channel. I emphasize that the 1896 election, by reducing uncertainty surrounding the gold standard, increased bank deposits, which in turn increased the amount of credit, supporting a broader economic expansion. Building off the evidence on banking activity in Fulford and Schwartzman (2018), I argue that railroads in areas with greater increases in bank leverage saw greater increases in their earnings. Overall, the results on earnings and investment demonstrate how financial factors can amplify and dampen the real effects of policy uncertainty.

NEWSPAPER BIAS AND SILVER COINAGE UNCERTAINTY

What motivates bias in reporting on economic policy issues? In my third dissertation chapter, I study the correlates of the quantity of newspaper coverage going to the gold standard and silver coinage as well as how these newspapers commented on gold and silver coinage between 1878 and 1897. I do so with a panel of eight newspapers that spanned the United States geographically and ideologically. I record monthly counts of articles containing one of several biased phrases related to the gold standard or silver coinage for this panel.

I begin my analysis by exploring how economic conditions affected the amount of biased coverage across time and across newspapers with different ideological stances towards the gold standard. Motivated by informal findings in the modern setting regarding inflation reporting and the level of inflation, I study whether uncertainty surrounding the gold standard increased biased reporting on the issue. As proxied by the level of gold in the treasury and the change in the price index for farm goods, I show that, as silver coinage risk and gold standard uncertainty increased, so too did biased reporting by both pro-gold and pro-silver newspapers.

Next, I read many of the articles containing biased phrases towards silver and gold. I observe that many of these articles broadly relate to elections, so I check whether this is true in a quantitative sense. Indeed, I find that approximately one-third to one-half of the biased phrase articles in the newspapers with a clear editorial slant on the issue contain either the word "election" or the word "convention" as well. Further,

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these biased articles about elections drive overall variation in articles containing biased phrases about the gold standard. Across newspapers and biased phrases, the correlation between overall biased article counts and those about elections is close to one. At the same time, the correlation between biased phrase articles and articles containing the phrase "silver bill" (indicating legislative action on silver coinage) is close to zero for all newspapers. These results highlight the importance of the electoral process in driving media bias on economic reporting.

CONCLUSION

This dissertation estimates the economic costs of the Free Silver movement at both the aggregate and firm level, as well as shows the role of gold standard uncertainty in shaping economic reporting. Further, it documents the importance of gold-denominated debts in creating these costs of nominal uncertainty. Developing countries today have accumulated large amounts of foreign currency debt, and many also peg their exchange rates to other currencies. The example of the United States in the late nineteenth century shows the potential costs of pursuing these policy choices, costs that have proven difficult to measure in modern settings.

Colin Weiss, *Board of Governors of the Federal Reserve System*

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The Dissertations of Eduardo Montero, Erik Prawitz, and Kilan Rieder: 2018 Alexander Gerschenkron Prize Competition

The Alexander Gerschenkron prize is awarded for the best dissertation on areas outside the United States and Canada. With the rise of global economic history and the spread of cliometric and quantitative approaches, awarding the Gerschenkron prize has become an ever more arduous, but also rewarding task.

This year saw 19 submissions covering Argentina, Austria, Brazil, Britain, Democratic Republic of the Congo (DRC), El Salvador, France, Indonesia, Italy, Russia, Sweden, and the ex-Yugoslavia as well as many other countries within sub-Saharan Africa. The temporal coverage was similarly impressive with papers ranging from the origins of agriculture circa 8000 BCE to the financial crisis of 2007. The majority of papers, however, focused on the nineteenth and early twentieth centuries, eras for which we have rich data and which are crucially important for understanding the origins of modern economies.

With 19 excellent dissertations, selecting three finalists was extremely difficult. My shortlist captures the richness and variety of the best work being conducted in economic history. Competition was extremely tight, however; there were at least six or seven dissertations that would have been worthy finalists. My selection procedure thus aimed to capture the diversity of research being conducted.

EDUARDO MONTERO

Eduardo Montero's dissertation *Essays on the Political Economy of Development* consists of three essays. The first chapter is entitled *Cooperative Property Rights and Development: Evidence from Land Reform in El Salvador*. Land reform is one of the most important topics in the twentieth century economic history of many parts of the developing world including Japan, Taiwan, and South Korea.

The policy of land reform in El Salvador had some interesting features. In particular, there was a cumulative landholding threshold of 500 hectares above which land was expropriated and handed over to cooperatives. This enables Montero to conduct a regression discontinuity design (RDD) approach, comparing territories just below and just above the threshold. The former remained haciendas while the later became cooperatives.

Guided by a model, Montero notes that both haciendas and cooperatives face moral hazard problems. But these vary accord to crop type. Haciendas face moral hazard due to share cropping. Cooperatives may redistribute the earnings from cash crops undermining effort incentives.

The empirical evidence supports these predictions. As is often the case in good economic history research, the devil is in the details. Cooperatives shift away from cash crops where they are more likely to face perverse incentives, but they are more productive in staple crops.

In the second chapter *The Legacy of Colonial Medical Campaigns in Central Africa*, Sara Lowes and Montero study the long-run impact of French colonial campaigns against sleeping sickness from the 1920s to the 1950s. For this chapter, the authors

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construct a novel dataset of the location of sleeping sickness campaigns from French colonial archives.

They then examine the impact of these campaigns on trust in medicine in survey data today. They find that they are associated with refusal to take blood tests. Specifically, the average treatment—15 years of exposure to colonial medical campaigns raises refusals by 5.1 percentage points. Intriguingly, these effects are highly specific to healthcare projects. Areas with greater exposure to these campaigns have low rates of vaccinations among children and worse overall healthcare outcomes. But colonial medical campaigns are not associated with less successful projects in other domains.

To establish that these effects are causal, Lowes and Montero construct an instrument based on relative soil suitability for cassava, interacted with distance to the colonial capital. This instrument is motivated by the colonial administrators' observation that sleeping sickness was associated with cassava production (partly because the processing of cassava involves water and hence attracts tsetse flies).

The third chapter (with Sara Lowes) considers the legacy of colonial rubber concessions in the Congo. This chapter is very much in the tradition of recent work on the long-run effects of extractive institutions (Dell 2010; Nunn and Wantchekon 2011). The authors study the legacy of rubber concessions, which were associated with the violent mistreatment of the native population by private companies.

Using an RDD approach, they find that rubber concessions are associated with lower quality local government but also with higher levels of trust. Sharing norms are stronger within former rubber concessions. This is consistent with work that suggests that certain types of negative shocks, such as civil wars, can promote trust and social capital (Voors, Nilleson, Verwimp, et al. 2012; Gilligan, Pasquale, and Samii 2014) whereas other shocks, such as political persecutions undermine social capital (Xue and Koyama 2017). Worse governance means that people rely less on the state and more on local communities. This is important; social scientists often like to assume that good outcomes go together. History, however, is often more complicated than this.

ERIK PRAWITZ

Erik Prawitz's dissertation, *On the Move: Essays on the Economic and Political Development of Sweden* can be viewed as asking the question: What made Sweden, Sweden? That is to say, how did Sweden become one of the richest, most stable, egalitarian, and innovative states in the world? Contrary to the popular impression of many in the Anglo-Saxon world, Sweden is not socialist, but combines a highly innovative market economy with high levels of social insurance and redistribution. Prawitz's dissertation employs novel data to study the empirics and the history of Swedish economic and political development from the late nineteenth century to the present.

The first essay in the dissertation entitled *Exit, Voice, and Political Change* co-authored with Mounir Karadja, finds that migration from Sweden was associated with labor organization and left-wing voting in the early twentieth centuries. In other words, it was those counties that had the most migration that led the way in moving Sweden towards social democracy.

The authors' preferred explanation is that migration led to labor scarcity, which improved labor's bargaining position and enabled workers to organize politically. Local government became more responsive and representative. Of course, a number of alternative hypotheses are possible. Perhaps more entrepreneurial and right-learning Swedes

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selected to migrate? Rather than dismissing these possibilities, Prawitz and Karadja do their best to show that these cannot account for the entirety of the effects they find.

This case study is extremely valuable, and I learned a lot about the political economy of Sweden in the early twentieth century. It also raises interesting questions about external validity. Labor scarcity is associated with the improvement of the conditions of labors in medieval England, where the Black Death brought an end to serfdom. But labor scarcity does not always improve the bargaining power of workers (by making labor more valuable it can led to the imposition of labor coercion). Future work on political economy should investigate the relationship between factor prices and political power further.

One characteristic of Prawitz's dissertation is that it combines novel data with careful attention to questions of identification. The authors use an instrument that combines the distance to reach an emigration port and severe local frost shocks that sparked an initial wave of emigration. Due to chain migration, this is a predictor of subsequent migration and should be uncorrelated with other political, economic, or demographic developments.

The second substantive chapter, *Mass Migration, Cheap Labor, and Innovation* argues that migration was associated with more inventiveness in sending regions. Labor scarcity prompted mechanization and the invention of labor-saving machinery. To establish causality, the same instrument is employed as described above. This paper is well done and helps substantiate other historical examples of biased technological change (i.e., Allen 2009).

The third chapter, *On the Right Track: Railroads, Mobility and Innovation,* studies the impact of the railroads on innovation. The authors find that areas traversed by the railroad became more innovative and that the railroad allowed innovators to collaborate over longer distances. The final chapter, *Homeownership, Housing Wealth, and Socioeconomic Outcomes: Evidence from Sweden* studies the impact of recent house building on wealth and other socioeconomic outcomes.

In summary, each chapter in this dissertation is tightly argued and each makes a separate contribution both to the economic history of Sweden and to our more general understanding of the relationship between migration, innovation, and political economy.

KILAN RIEDER

Kilian Rieder's dissertation is entitled *(Un)promising Beginnings—Bagehot in the Land of the Waltz: Financial Crises and Lending of Last Resort in the Austro-Hungarian Empire (1868–1914)*. In this dissertation, Rieder has undertaken an exhaustive and extremely impressive study of how the Austro-Hungarian Central Bank acted as a lender of last resort (LLR) in the late nineteenth century. He focuses much of his attention on its response to the crisis of 1873. An impressive characteristic of this dissertation is the sheer volume of new data presented before the reader. To conduct his analysis, Rieder collected information from the official statistical yearbooks for Austria and Hungary and a privately published financial yearbook, complemented with data published in Austrian newspapers, and other sources.

The best economic history is often informed by contemporary concerns. Hence it is no bad thing that Rieder's eye is half on the present and on the extraordinary actions taken by central banks such as the Federal Reserve in the wake of the 2008 Financial Crisis. Until recently the analysis of central banks has focused on issues of inflation

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targeting, the Financial Crisis has returned attention to the role central banks play as lenders of last resort. Rieder demonstrates that much can be learned by studying the choices made by continental central banks in the latter half of the nineteenth century and early twentieth century, central banks that have been neglected relative to their peers in Britain or America.

Chapter 1 examines the causes of bank distress in the 1873 crash. This was the most severe financial crisis experienced by the Dual monarchy: 30 percent of banks closed and 40 percent of total equity in the banking sectors evaporated. Rieder's analysis of this crisis is incredibly detailed, informed by both an excellent knowledge of the latest economics research and a deep understanding of the specific historical context. Estimating a survivor function at the bank level, he documents that the 1873 crisis was in the repo market rather than the real estate market thus resembling the crash of 2008 in many respects. Rieder provides a detail analysis of this crisis demonstrating that many of the loan defaults represent a classical example of bad bank-level fundamentals, reflecting that bank-level solvency component of financial distress in 1873. This analysis is complemented by a detailed examination of the microstructure of the repo market.

Chapters 2 and 3 examine the response of the Austria central bank. Specifically, Rieder considers the response of private market actors to form support committees to extend credit when the central bank failed to discharge its duties as a LLR. Moral hazard was a major issue for the Austro-Hungarian Central Bank. To deal with it, the bank successfully used credit limits to limit excessive risk-taking during normal times but relaxed these limits during crises. Chapter 2 analyzes the role played by the AHCs–support communities (AHCs), which received financing from the Austrian Central Bank. Rieder provides evidence that AHCs stabilized the overall banking system. Banks that were members were significantly less likely to fail. But for the average bank it was more important to see their business partners to become AHCs members than to participate directly.

Chapter 3 examines the role credit limits played as "contingent rules" in the late nineteenth century. Rieder notes that AHCs had access to private information; hence they could screen borrowers limiting the problem of moral hazard and pool liquidity. Rieder argues that the Austro-Hungarian Bank used a system of credit limits" as an instrument to address moral hazard concerns. These credit limits were enforced in normal types, but relaxed during periods of crisis. Importantly, the central bank's willingness to increase the limit during a period of distress was conditional on a positive initial credit assessment. Banks that were exposed to an unexpected liquidity shock could be expected to be treated leniently.

In summary, these are three fine dissertations. Though very different, each makes an important scholarly contribution to their field of study. The three authors will undoubtedly be major contributors to the field in future years.

Mark Koyama, *George Mason University*

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Essays on the Political Economy of Development

This dissertation focuses on understanding the comparative historical development of Latin America and Sub-Saharan Africa. The dissertation approaches this question from the lens of the political economy of development by focusing on how variation in institutional arrangements, such as property rights regimes, and cultural values, such as mistrust and pro-social norms, affect development.

The first chapter in my dissertation, titled "Cooperative Property Rights and Development: Evidence from Land Reform in El Salvador," seeks to understand the consequences of land reforms in Latin America and the cooperative property rights regimes instituted during many of these reforms by focusing on El Salvador. Between 1930 and 1980, the majority of countries in Latin America underwent large land reform programs that sought to redistribute landholdings from large hacienda owners to agricultural laborers (de Janvry 1981; Albertus 2015). Instead of defining private property rights, these land reforms often distributed these landholdings in the form of agricultural cooperatives, where workers jointly own and manage production and share profits, in hopes of increasing equity without decreasing efficiency in production. Although there is this rich theoretical literature on the implications of cooperative property rights for productivity, equity, and development, we have little empirical evidence of their lasting impacts (Putterman 1991; Bonin, Jones, and Putterman 1993; Pencavel 2013).

The main empirical challenge when studying the impacts of cooperative property rights relative to outside ownership is that property rights arrangements are not randomly assigned. The choice of property right system may reflect the underlying characteristics, such as geography, capital requirements, or cultural practices. These characteristics may also affect outcomes such as productivity. This means that one cannot compare all cooperatives to non-cooperatives to identify the impacts of cooperative property rights. This empirical challenge has left a considerable gap in the research on the implications of cooperative ownership relative to outside ownership (Putterman 1991; Bonin, Jones, and Putterman 1993; Pencavel 2013).

Eduardo Montero, University of Michigan, Ford School of Public Policy, 735 S. State St., 4219, Ann Arbor, MI 48109. E-mail: emontero@umich.edu (www.eduardo-montero.com). This dissertation was completed under the supervision of Nathan Nunn at Harvard University.

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This first chapter therefore uses a particular feature of the land reform program from El Salvador in 1980 to study the impacts of cooperative property rights on agricultural productivity, crop choices and economic development. During this reform, land belonging to individuals with cumulative landholdings over 500 hectares (ha) was expropriated by the military and redistributed to their former hacienda workers in the form of cooperatives, but land belonging to individuals with cumulative land holdings under 500 hectares was never expropriated and remained as privately-owned haciendas. I use a regression discontinuity design—where I compare properties that were just above and below this cumulative plot ownership threshold but are similar on other characteristics except that the former became cooperatives—and data from El Salvador's 2007 census of agriculture, to estimate the economic impacts of communal property right institutions relative to the private ownership system (*haciendas*).

I find that, relative to *haciendas*, cooperatives are less likely to focus on cash crops and are less productive at cash crops. However, cooperatives are both more likely to produce staple crops and are more productive at these crops. I find no evidence that cooperatives are on aggregate less productive than haciendas, as measured by revenues per hectare or profits per hectare. I then use household survey data to examine the impacts of cooperative property rights on worker incomes and inequality at the worker level to understand the equity implications of cooperative property rights. I use household survey data to identify individuals working in the reform cooperatives and those working on *haciendas*. I find that the income distributions for cooperative members are more equitable and have higher means compared to the income distributions of workers on *haciendas*. I supplement this analysis with a model developed in the chapter and with focus group evidence on how cooperative members view the benefits and costs of cooperatives compared to their experiences as *haciendas* laborers before the reform. These results together suggest that while the cooperative property rights may reduce efficiency at the property-level, they have important additional impacts on equity and worker incomes. Examining this land reform serves as a starting point for understand the understudied economic consequences of similar land reforms across Latin America. It also speaks to a modern policy dimension in Central America today, as there has been renewed interest in exploring "cooperative development" after the United Nations declared the year 2012 as the "International Year of Cooperatives."

The second chapter of my dissertation is titled "The Legacy of Colonial Medicine in Central Africa" and is co-authored with Sara Lowes. It examines the origins and consequences of mistrust in medicine in central Africa. There is a large body of anecdotal evidence from Africa of mistrust in medicine leading to under-utilization of health care. Relatedly, research in developing countries has highlighted that even when there is access to high-quality preventative and therapeutic tools, demand remains puzzlingly low (Dupas 2011; Dupas and Miguel 2017).

Between the 1920s and 1950s, French colonial governments undertook extensive medical campaigns in sub-Saharan Africa aimed at managing tropical diseases. In Cameroon and former French Equatorial Africa (present day Central African Republic, Chad, Republic of Congo, and Gabon, henceforth AEF), the colonial governments organized campaigns against a variety of tropical diseases, including sleeping sickness, leprosy, yaws, syphilis, and malaria. The largest of these campaigns focused on treating sleeping sickness, a lethal disease spread by the tsetse fly. Millions of individuals were subjected to medical examinations and forced to receive injections of medications

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with serious side effects, including blindness, gangrene, and death. For many, these campaigns were their first exposure to modern medicine (Headrick 1994; Lachenal 2014).

Motivated by work from anthropology and history which links colonial medical campaigns against sleeping sickness and mistrust in medicine (Feldman-Savelsberg, Ndonko, and Schmidt-Ehry 2000; Lachenal 2014), we hypothesize that the colonial medical campaigns may have had a series of unintended effects on both beliefs about modern medicine and the success of modern health interventions. The campaigns may have affected trust in medicine because: villagers were forced to receive injections, many of the medications had serious negative side effects, and the medications were ineffective. Thus, we examine the effects of historical colonial medical campaigns on present day trust in medicine, health outcomes, and the success of World Bank health projects.

To measure exposure to colonial medical campaigns, we construct a novel data set from over 30 years of archival data from French military archives for five countries. This data set documents the locations of sleeping sickness campaign visits at a granular geographic level between 1921 and 1956. We measure trust in medicine by whether an individual consents to a free and non-invasive blood test for either anemia or HIV in the Demographic and Health Survey (DHS). We consider consent to the blood tests to be a revealed preference measure of trust.

We find a significant negative correlation between historical exposure to campaigns and trust in medicine. Approximately 4.7 percent of the sample refused the blood tests. Being visited by the colonial medical campaigns 15 years, the average number of years an area is visited, increases refusals by 5.1 percentage points. The results are robust to a variety of geographic, colonial, pre-colonial, and individual level controls, and an instrumental variable strategy to isolate causation. We also present evidence that the history of colonial medical campaigns is associated with worse health outcomes in both the DHS biomarker data and in terms of vaccination rates for children.

We then turn to examining the relevance of historical medical campaigns for present day health policy by examining how differential exposure to colonial medical campaigns affects success of present day health interventions. We use data on the location of World Bank projects approved between 1995 and 2014 to examine how exposure to medical campaigns affects project success as rated by the World Bank using data from AidData (2017). We show that greater exposure to the campaigns is correlated with less successful health projects but does not negatively affect the success of projects in other domains. These results highlight the importance of the colonial medical campaigns for understanding the efficacy of present day health policies, and more broadly, how historical experiences can affect policy.

The third chapter of my dissertation is titled "Concessions, Violence, and Indirect Rule: Evidence from the Congo Free State" and is co-authored with Sara Lowes. The chapter examines the lasting impacts of colonial concessions by focusing on the case of the Congo Free State (henceforth, CFS). The CFS, what is today the Democratic Republic of Congo (DRC), was the personal colony of King Leopold II of Belgium between 1895 and 1908 and is infamous for its brutal mistreatment of the Congolese people and its plunder of Congo's natural resources, particularly in the extraction of rubber. While the concessions granted under the CFS and the subsequent abuses that occurred are particularly infamous, in sub-Saharan Africa, all major colonial powers granted concessions to private companies to extract natural resources during the colonial era. These concessions were often characterized by the use of extreme violence and the

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co-option of local leaders (Mamdani 1996). Despite that concessions to private companies were common across colonial Africa, there is no causal evidence on their impacts.

We use the well-defined boundaries of the two largest rubber concessions, ABIR and Anversoise, to examine the long-run effects of exposure to the concessions, violence, and indirect rule on economic development. We use modern Demographic and Health Survey (DHS) data and a geographic regression discontinuity along the former concession boundaries and find that villages inside the former concession borders have significantly worse education, wealth, and health outcomes compared villages just outside these boundaries.

We then use survey and experimental data that we collected in Gemena, DRC, a town on the border of the former Anversoise concession, to examine how the effects of extractive institutions persist through local institutional quality and cultural norms. Gemena was created after the end of the concession era; therefore, those who live there are migrants themselves or decedents of migrants. Our analysis compares individuals in Gemena with ancestors from inside the former concessions to individuals with ancestors from outside the former concessions.

Using this original survey data, we first examine how exposure to the rubber concessions has affected culture, which we define as the beliefs and values held by individuals. We measure several different cultural traits, including trust, social cohesion, altruism, and support for sharing income, using both survey and experimental measures. A growing literature has highlighted a positive correlation between exposure to violence and pro-social norms (Bauer, Blattman, Chytilová, et al. 2016). Building on this correlational evidence, we examine the causal effects of violence. Using survey questions on trust in a variety of other individuals or groups, we find that individuals from areas exposed to the rubber concessions are *more* trusting of others than those just outside the former concessions. Additionally, because the historical narrative describes how communities responded to the concessions by increasing reliance on social ties and informal insurance, we then examine measures of social cohesion and support for sharing income. We provide evidence that individuals from the former concession areas report feeling closer to a variety of others and are more likely to agree with statements asking whether money earned by both luck and effort should be shared with others. Additionally, in an experimental task designed to test support for sharing income, individuals from concession areas are more likely to redistribute money from another player's earned endowment.

We then examine how the concessions have affected local institutions. We test whether villages of origin within the former concessions have lower quality village institutions as measured by: (i) the selection mechanism for the chief (elections versus hereditary) and (ii) the extent to which the chief provides various public goods for the village. We find that village chiefs within the former concessions are 17 percentage points less likely to be elected to their position and are more likely to be hereditary. Given that we elected leaders (rather than hereditary leaders) are more accountable to their constituents, this suggests that leaders in villages in former concession areas are less accountable. Consistent with this, the village chiefs inside the former concessions are also less likely to provide critical public goods. Across these various measures, villages in the former rubber concessions have worse local institutions and lower provision of public goods. The results suggest that while violence may increase pro-social behavior, this is not sufficient to overcome the negative effects of indirect rule on local institutions. These results have broad implications for the large parts of Africa that were allocated to private concessions.

EDUARDO MONTERO, *University of Michigan*

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On the Move: Essays on the Economic and Political Development of Sweden

The transformation of Sweden, from an agricultural society in the mid nineteenth century to one of the world's richest nations at the start of WWI, was remarkable. Beyond the well-documented increase in real wages, Sweden established itself as an entrepreneurial welfare state. In fact, concurrent to the rapid economic upswing, it

Erik Prawitz, Research Institute of Industrial Economics, Grevgatan 34 - 2 fl, Box 55665, SE-102 15 Stockholm, Sweden. E-mail: erik.prawitz@ifn.se. This dissertation was completed under the supervision of Jakob Svensson (chair), Torsten Persson and David Strömberg at the Institute for International Economic Studies, Stockholm University.

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underwent a period of substantial political change. One of the aims of my dissertation is to shed light on the possible causes behind this striking transformation and, thus, improve on the understanding of why Sweden became Sweden of today—in terms of both its economic and political development.

The dissertation consists of four self-contained essays. The first two essays explore how migration may affect the locations that migrants leave behind by studying the Swedish experience during the "Age of Mass Migration," the era of European mass migration to the United States (1850–1913). While the impact of the European immigration on American conditions has been extensively researched, there is a lack of studies concerning the sending regions (Abramitzky and Boustan 2017).[1] Yet, the 30 million Europeans that left their home soils during this era must have had a substantial impact on their countries. In Sweden, a quarter of the population or about 1.3 million citizens emigrated in the course of 60 years, making it one of the countries with the highest exit rates.[2]

In the first essay, entitled "Exit, Voice and Political Change: Evidence from Swedish Mass Migration to the United States," my co-author and I study the effects of emigration on the political development in different Swedish municipalities.[3] The potential role of U.S. emigration in affecting the political development in Europe was discussed as early as the eighteenth century. The French economist and statesman Anne-Robert-Jacques Turgot argued that "the asylum which [the American people] opens to the oppressed [...] will oblige the European governments to be just and enlightened" (Turgot 1810, p. 389). Much later, B.J. Hovde (1934) argued that the credible option of emigrating during the Age of Mass Migration improved the bargaining position of labor. Focusing on Sweden, mass emigration coincided with a period of political development. The Social Democratic Party as well as the powerful labor union movement were founded and became key actors in reforming Swedish policy and political institutions.

To identify the causal effect of total emigration over several decades on political development, we exploit the combination of the distance to reach an emigration port and severe local frost shocks that sparked an initial wave of emigration. Due to the importance of chain migration, we are able to predict variation in emigration across the entire migration period 1867–1914. Our instrumental variable (IV) estimates show that emigration positively affected participation in the nascent labor movement. Municipalities with high emigration rates increased membership rates and participated to a greater extent in strikes. Moreover, they witnessed higher support for the labor-friendly left-wing parties. Emigration also led to de facto political change. It positively affected welfare expenditures and increased the likelihood of adopting more inclusive local institutions. Going through possible mechanisms behind these results, we show that migrant selection is unlikely to fully explain our results. Likewise, we find little evidence that economic change resulting from migration or potential transfers of American attitudes are key explanations. Instead, we suggest that the increased outside option that migration accounted for may have played an important role in enabling workers to take higher risks and organize themselves in labor unions. Crucially, the outside option was greater in locations with early U.S. emigration, as they established social networks overseas. Thus, we argue that "exit" and "voice" can be complements, since the credible threat of

[1] Hatton and Williamson (1998) constitutes one of the few exceptions.

[2] The net annual migration rate 1870–1910 was about −4.2 per 1000 inhabitants. By comparison, the average rate in the Old World was about −3.08, with Ireland, Italy, and Norway displaying rates of −11.24, −9.25, and −5.25, respectively (Taylor and Williamson 1997).

[3] This chapter is co-authored with Mounir Karadja.

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exit can be used to enhance voice, similarly to what Albert Hirschman also expressed in his later writings (Hirschman 1978).

The second essay, "Mass Migration, Cheap Labor, and Innovation," explores the relationship between labor mobility and technical advances by studying the Age of Mass Migration.[4] In contrast to recent work by Richard Hornbeck and Suresh Naidu (2014) and Michael Clemens, Ethan Lewis, and Hannah Postel (2018), who relate outmigration to technical change in terms of adoption, our focus is on new innovations as measured by granted technological patents.Assembling a novel and detailed data set on all granted Swedish patents between the mid-nineteenth century and WWI, my co-authors and I show that municipalities with high emigration rates also witnessed an increase in innovative activity. Our IV estimates report that a 10 percent increase in the number of emigrants 1867–1900 increased the number of patents by roughly 6 percent. By weighting patents by the patent fees paid for each patent, seen as a measure of the economic value of patents in the innovation literature (see, e.g., Schankerman and Pakes 1986; Burhop 2010), we show that these patents were economically meaningful. In extended work, we also document that emigration positively affected technological adoption and, moreover, that locations with high emigration rates to a greater extent reallocated workers from the agricultural sector to the burgeoning industrial sector. Studying the effect of emigration on wages, we find that real low-skilled wages increased in counties with high emigration, consistent with earlier work by Ljungberg (1997) as well as Kevin O'Rourke and Jeffrey Williamson (1995).

Exploring possible mechanisms, we suggest that the increase in labor costs may have induced technological innovation, consistent with the idea of "induced innovation" (Habakkuk 1962; Allen 2009; Acemoglu 2010). Although we cannot fully reject the role of accumulated human capital abroad, we show that return migration seems to have played a limited role in explaining the results that we find. Innovations by inventors with typical return migrant occupations increased comparatively less and although return migration is positively associated with patents, this relationship is statistically insignificant when conditioning on emigration. However, it remains an open question to what extent high levels of human capital was a necessary condition for the Swedish surge in innovative activity.

The third essay, "On the Right Track: Railroads, Mobility, and Innovation during Two Centuries," explores another aspect behind the surge in innovative activity that Sweden underwent around the shift towards the twentieth century.[5] My co-authors and I study the rollout of the railroad network in the latter part of the nineteenth century and how it integrated distant localities. To overcome concerns regarding the endogenous placement of the network, our analysis exploits the fact that the main trunk lines were built with the overarching aim to connect particular city centers, while at the same time considering construction costs. Using Edsger Dijkstra's algorithm (Dijkstra 1959), we construct least-cost paths of the network and adopt a difference-in-differences framework to study the effects of railroad access on innovative activity. We demonstrate that railroad access substantially increased innovative activity: the number of active innovators increased and the average innovator became more productive. Importantly, we show that it is unlikely that these effects are explained by spatial reallocation. Moreover, using contemporary data on granted patents from the last decades, we show that differences in innovative activity persist to the present day.

[4] This chapter is co-authored with David Andersson and Mounir Karadja.
[5] This chapter is co-authored with David Andersson and Thor Berger.

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Exploring the effects of knowledge diffusion across space, our analysis shows that innovators residing in areas traversed by the railroad started to collaborate more and over longer distances, and in particular with other innovators located along the unfolding railroad network. In extended work, we show that railroads, besides facilitating collaboration in the production of ideas, also affected the nascent market for buying and selling patents. We show that patent transfers increased between buyers and sellers connected by the railroad network. In particular, we show that transactions were facilitated between independent inventors in remote areas and buying firms. Railroads may, thus, have reduced spatial frictions in the market for innovation.

While the above chapters focus on the transformation from an agricultural society to the entrepreneurial welfare state of today, the last essay of the thesis concerns one of the most salient issues in the Swedish public debate of the last decades, namely the housing market. As a sort of heritage of the Swedish welfare state, rental prices have long been restricted by rent control. In a "homeownership wave," starting at the turn of the twentieth century, many tenants of rental apartments were given the opportunity to buy their apartments at prices well below the prevailing prices in the ownership market. In Stockholm city alone, the publicly owned housing subject to this wave (1999–2010) saw more than 4 billion EUR in total transaction costs change hands from the buying tenants to the state (Sjölin 2012).

In "Homeownership, Housing Wealth, and Socioeconomic Outcomes: Evidence from Sweden 1999–2007," I show that the tenants that were allowed to buy their apartment benefitted considerably in terms of net wealth. Using detailed administrative register data spanning several years, I compare changes in outcomes for individuals subject to an ownership transfer to changes in outcomes for similar individuals who never got the opportunity to buy their homes. Despite the large lump-sum transfer, the average individual only modestly adjusted her behavior in terms of labor market participation and demographic decision-making; potentially due to the less liquid nature of housing wealth (Case, Quigley, and Shiller 2005). Exploring heterogeneity in terms of age, however, I find that the average effect masks differences across age groups. In contrast to individuals in their middle ages, individuals near their retirement age decreased their labor market participation considerably.

Erik Prawitz, *Research Institute of Industrial Economics*

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(Un)promising Beginnings — Bagehot in the Land of the Waltz: Financial Crises and Lending of Last Resort in the Austro-Hungarian Empire (1868–1914)

For decades, central banks' role as lenders of last resort (LLR)[1] was considered a relic of the past with limited policy relevance. Since the Global Financial Crisis of 2008, however, renewed academic interest in the LLR has pushed the boundaries of the concept and reignited hitherto unsettled debates. Recent academic contributions have

Kilian Rieder, University of Oxford, Pembroke College, High Street, OX1 4BH Oxford, United Kingdom. E-mail: kilian.rieder@pmb.ox.ac.uk. This dissertation was completed under the supervision of Rui Esteves at the University of Oxford.

[1] The LLR as understood in my dissertation is an ad-hoc or permanent institution which provides an elastic source of liquidity for the benefit of all financial intermediaries during a systemic liquidity crisis. As the monopoly issuers of currency, central banks are in a natural position to act as LLRs.

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also shown that we still lack a firm grip on some of the most fundamental challenges haunting the LLR ever since the term was first coined. Three questions stand out in this regard—and these questions lie at the core of my dissertation. First, how can central banks acting as LLR distinguish illiquid from insolvent financial institutions (if at all), and is this distinction necessary for a successful LLR? Second, once a case for support has been made, how should the LLR be designed in order to be effective? Third, what are convincing techniques to tackle moral hazard deriving from the LLR's support for financial institutions?

In order to evaluate policy responses to specific periods of financial distress, an in-depth knowledge of the context and dynamics at hand is indispensable. Chapter I sets the groundwork for my dissertation: it examines the causes of bank distress during the Austro-Hungarian *Gründerkrach* (founders' crash) of 1873. The *Gründerkrach* stands out as the most severe financial crisis which hit the Habsburg Empire during the 50 years of Austro-Hungarian dualism. In Chapter I, I show that bank closures during the *Gründerkrach* were tightly connected to the collapse of a vibrant market for repurchase agreements (also called "repos") in Vienna. Repo loans were an essential part of banks' investment banking business model at the time: in order to boost the attractiveness of initial public offerings (IPOs), banks granted repo loans against equity shares they themselves had introduced to the market—with mostly brokers and stock market investors on the borrower side. I show that repos served the purpose of addressing concerns about after-market liquidity known to be important in IPO underpricing (Ellul and Pagano 2006). In Chapter I, I estimate several cross-sectional and panel regressions, using binary response as well as semi-parametric survival models. To address the problem of omitted variable bias, I draw on a technique called "baseline hazard stratification." This method is the survival analysis analogue to a fixed effects estimator in panel regressions. It can be used to purge the model of unobserved heterogeneity at a specified group-level.

Chapter I of my dissertation shows that banks, which were forced to sell the collateral in response to heavy funding withdrawals, had to write-off substantial portions of their repo portfolios and incurred heavy losses during *Gründerkrach* of 1873. Therefore, the nature of bank distress in 1873 cannot be easily classified. Bank failures did not spring from a pure liquidity problem, nor did they derive from a simple solvency shock. Rather, repo lender distress emerged from the combination of several different shocks: bank-level liquidity and solvency problems paired with deteriorating market illiquidity. Chapter I thus raises the question whether and how policy could have mitigated bank distress during the crisis of 1873. Furthermore, my findings in Chapter I qualify the received wisdom that the *Gründerkrach* banking crisis derived from a bursting real estate bubble which subsequently compromised the financial health of credit institutions. Finally, my results corroborate work by Adam Copeland, Antoine Martin, and Michael Walker (2014) who emphasize the role of market microstructure in explaining the varying degrees of resilience to distress in different segments of the U.S. repo market. The Austro-Hungarian experience of 1873 suggests that repo markets with short maturities in which lenders themselves are susceptible to sudden funding withdrawals are prone to sudden break-downs of funding flows.

In Chapter II, I show that the *Oesterreichische Nationalbank* (OeNB, Austria's central bank; later also *Oesterreichisch-ungarische Bank*, OeUB) initially rationed credit through its discount facility during the peak of the *Gründerkrach* in May 1873. As the crisis evolved, however, the central bank engaged in several specific policy responses

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which were primarily motivated by considerations to avoid negative externalities of systemic financial distress. In particular, the central bank coordinated and participated in an unconventional lender of last resort mechanism to stem the liquidity crisis. Facing the central bank's limited willingness to provide direct liquidity support, market participants joined forces to preempt large-scale fire sales during the *Gründerkrach*. Bankers, brokers, and investment firms founded so-called *Aushilfs-Comités* (AHCs, support committees) in all major cities of the Habsburg Empire. The OeNB agreed to grant direct refinancing lines to these committees in return for the joint guarantees of their members and the creation of equity funds to cover up losses from the committees' lending activities. On the basis of these guarantees, the central bank even allowed rediscounts of substandard paper by the AHCs.

The LLR solution devised in response to the *Gründerkrach* differed in design from the classic Bagehot-style LLR in that it interposed another layer between the central bank's standing facility and liquidity recipients. At the same time, the solution chosen in 1873 shared the principle of "wide eligibility" present in the classic LLR model because anybody could join an AHC and apply for a loan as long as a subscription to the equity fund was made. "Wide eligibility" and the explicit aim to stem a systemic problem, rather than distress at individual institutions, clearly distinguish the AHCs from so-called "life-boat operations" (Hautcœur, Riva, and White 2014). Chapter II shows that this unconventional LLR effectively mitigated bank distress during the *Gründerkrach*. To estimate the treatment effect of the non-standard LLR intervention on bank survival, I use a two-stage inverse-probability-weighted regression adjustment (IPWRA). IPWRA addresses the empirical problem of banks' endogenous selection into AHCs.

Chapter II argues that AHCs can be viewed as innovative solutions remedying the under-provision of a good particularly desirable in times of crises: central bank liquidity. They helped alleviating central bank credit rationing by addressing some of the trickiest aspects haunting LLR ever since the concept was first coined. First, on the most basic level, AHCs reduced risk management costs for the central bank by shifting borrower screening activities back to market participants. Second, AHCs tackled information asymmetries faced by the central bank in direct LLR. They made effective use of private information on liquidity recipients and had an inbuilt defense against moral hazard. *Aushilfs-Comités* constituted an ad-hoc alternative to direct LLR lending in the absence of an institutionalized central bank risk management and monitoring framework. Third, the AHCs provided an indirect way of temporarily enlarging the pool of collateral eligible for last resort liquidity. Their joint guarantee structure, and their equity funds limited the amount of additional risk a similar enlargement would have triggered for the central bank had it acted as a classic LLR, while also addressing the moral hazard implications of the enlargement. Thus, *Aushilfs-Comités* constitute a useful precedent for recent proposals to ensure LLR access to a wide range of market participants beyond the traditional banking system via market solutions or private-public partnerships. The structure and set-up of *Aushilfs-Comités* provided a straight-forward answer to the key questions of collateral financing, collateral liquidation and loss allocation which are conventionally cited in this regard (Begalle et al. 2016).

While *Aushilfs-Comités* were designed in a way to minimize negative behavioral incentives for liquidity recipients, Chapter II only provides limited insight into how moral hazard was checked inter-temporally. Had the creation of *Aushilfs-Comités* with OeNB support become the general expectation in every crisis, credit institutions may

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have "banked" on this expectation. Of course, very nature of AHCs as ad-hoc committees might have limited the rise of pernicious incentives. Yet, their ad-hoc nature also explains why more structural attempts at limiting moral hazard remained absent at the time: with a central bank hesitant to assume the role as ultimate liquidity provider in a crisis, there was no fully-fledged, institutionalized LLR concerned with moral hazard. Over time, institutional changes allowed the OeNB to evolve into an institution up to the task: the Austrian central bank gradually adopted free lending practices towards the end of nineteenth century. This very evolution raises the following question: in the absence of explicit liquidity regulation, how, if at all, did the Bank address moral hazard deriving from the presence of its fully institutionalized LLR role? The purpose of the third chapter of my dissertation is to answer this question.

Chapter III (joint work with Clemens Jobst) analyses a hitherto unexplored mechanism to mitigate moral hazard in the context of the LLR: incentive systems. Ex-ante monitoring, combined with sanctions, can allow the central bank to prevent its counterparties from engaging in riskier behavior following the availability of last resort lending. Monitoring can also help the central bank to better dose LLR support when actually needed. We argue that the *Oesterreichisch-ungarische Bank* (OeUB) used a system of so called "credit limits" as an instrument to address moral hazard concerns. For every counterparty, the Bank set an individual maximum amount that the counterparty could borrow. Prima facie, the mere existence of credit limits might be interpreted as evidence that the earlier practice of credit rationing was still prevalent: the concept seems to fundamentally contradict the idea of free lending implicit in the LLR role. However, we show that while credit limits were enforced during normal times, they were flexibly raised in the event of a well understood exogenous liquidity shock. In this way, the Austro-Hungarian Bank abode by the principle of free lending while having a tool at hand to prevent the build-up of excess risk in normal times. We thus argue that managing moral hazard deriving from the provision of LLR facilities required an operationalization of credit limits as "contingent rules."

Preventing the build-up of excess risk in normal times requires two elements. First, the central bank must be able to monitor risk taking. We document the sophisticated system put in place by the OeUB. This system included the compilation of hard information like balance sheets and profit and loss statements by local branch offices as well as soft information obtained through local discount committees, regular visits by inspectors and an elaborate book-keeping system that allowed clerks to extract information from the bills submitted to the central bank. Second, the central bank must be able to sanction banks that take excessive risks. Here we argue that the power of the OeUB to do so stemmed from the possibility to lower or cancel the credit limits it had accorded to its counterparties. Ceteris paribus, banks had an interest in obtaining a high credit limit. During normal times a higher limit facilitated liquidity management as banks could hold (interest earning) central bank eligible bills instead of (unremunerated) cash, whereas in the event of stress a higher limit offered more breathing space before the central bank would have to be asked for an increase in the limit. In addition, we show that the central bank's willingness to increase the limit during a period of distress was conditional on a positive initial credit assessment. Even though the OeUB had no formal regulatory powers, the attractiveness of the central bank's discount window thus endowed the OeUB with some power to influence the banks' liquidity management by increasing or decreasing the banks' normal credit limit. We run regressions of credit limits on bank fundamentals providing suggestive evidence that the OeUB effectively adjusted

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credit limits as a function of the leverage and liquidity situation of its counterparties. These results are robust to several specifications, including bank-level fixed effects. Using variation in banks' exposure to exogenous liquidity shocks, we also show that the shocks caused the central bank to tolerate transgressions and increase limits. To the best of our knowledge, Chapter III provides the first economic interpretation and empirical analysis of a central bank's credit limit framework.

KILIAN RIEDER, *University of Oxford*

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