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series analyses further show that firms' cash reserves rise in times of high aggreinitiations fall, their spreads widen, and maturities shorten.

The Role of Liquidity When Capital Markets Collapse

The relation between corporate liquidity and real activity came to the forefront of the academic and policy debate during the global financial crisis. The credit market breakdown started in 2008 and became acute in the spring of 2009. Firms' inability to obtain external funding allowed researchers to look at corporate liquidity management at a time of acute liquidity scarcity.

In the fall of 2008, as the crisis started to engulf the economy, John Graham, Cam Harvey, and I sent out survey questionnaires to thousands of CFOs in 39 countries asking them about their corporate plans for the coming year.⁹ These data provided us uniquely forward-looking information about corporate liquidity management, and they revealed that managers thought of internal liquidity as a way to guard against a crash that was about to happen. We found that, in anticipation of a severe liquidity contraction, financially constrained firms put together plans to cut their cash stocks by as much as 15 percentage points, compared to only 2 percentage points, on average, among financially unconstrained firms. These planned cuts in liquidity were accompanied by other major changes. In particular, constrained firms reported plans to reduce employment (by 11 percent), technology spending (by 22 percent), capital investment (by 9 percent), as well as cash dividend payments (by 14 percent) in the year ahead. Financially unconstrained firms, in contrast, reported much milder changes in their planned policies for 2009. Notably, firms reported plans to resort to their bank credit facilities — drawing unprecedented amounts of Weisbach, "Corporate Demand for Liquidity," cash from their lines — as a way to insulate NBER Working Paper No. 9253, October against the effects of the crisis.

After gathering information on how access to funds modulated corporate plans during the crisis, Graham, Harvey, and

I teamed up with Erasmo Giambona to assess how firms chose between different gate volatility. At such times, credit line liquidity instruments.¹⁰ We used a new series of CFO surveys to gauge how firms' cash positions and cash flow impacted their access to credit lines and their plans with regard to saving. Pre-2008 cash positions proved to be of paramount importance. For firms coming into the crisis with healthy cash balances, cash flows had no bearing on their access to bank credit lines. Only the firms with low cash exhibited a positive correlation between operating cash flows and credit line access. Notably, firms with more cash had their investment plans boosted by greater access to credit lines. At the same time, lack of access to credit lines forced firms to choose between saving and investing. In the absence of precrisis savings, access to credit lines was crucial in allowing firms to invest and to survive in the years ahead. Our work extended to Europe, where bank-based economic systems made credit line access particularly important for corporate financing during the global downturn.¹¹ These analyses show that corporate liquidity management should not be restricted to the study of corporate cash, and that credit lines can play a fundamental role in insuring firms' access to liquidity in difficult times.

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Student Borrowing: Debt, Default, and Repayment

Lance Lochner

the United States and other developed countries have altered the landscape of higher education substantially in recent decades, with important implications for ior, Alex Monge-Naranjo and I argue in a series of recent papers.¹ First, the costs of accounting for inflation and expansions in student aid. Second, average returns highlighted by the Great Recession.

loans. Annual student borrowing levels and private student debt levels in the U.S. \$1.1 trillion in 2013, reflecting sizeable increases in both the incidence of debt and debt levels among borrowers.³

tribution of cumulative debt among U.S. baccalaureate recipients since 1989-90.

Three significant economic trends in rowers, declined from over 70 percent to less than 40 percent, while the fraction of college graduates borrowing more than \$30,000 rose from 4 percent to 30 percent.⁴ The steady rise in student borrowing student borrowing and repayment behav- over the late 1990s and 2000s masks the fact that government student loan limits remained unchanged (in nominal dolcollege have increased markedly, even after lars) between 1993 and 2008. Adjusting for inflation, this reflects a nearly 50 percent decline in value. In 2008, aggregate to college (net of tuition payments) have Stafford loan limits for dependent underincreased sharply. Third, labor market graduate students jumped from \$23,000 uncertainty has increased considerably, to \$31,000, although this value was still less than the 1993 limit after accounting The first two trends, rising costs and for inflation. Not surprisingly, the share returns to college, have contributed to a of full-time/full-year undergraduates that dramatic increase in demand for student maxed out Stafford loans increased more than five-fold from 1989-90 to 2003doubled in the 1990s and then again over 04.5 Undergraduates turned more and the next decade.² Combined government more to private lenders to help finance their education prior to the 2008 increase quadrupled from \$250 billion in 2003 to in federal student loan limits and contemporaneous collapse in private credit markets. Undergraduate borrowing from non-federal sources peaked at 25 percent Figure 1 documents the changing dis- of all undergraduate borrowing. Despite this increase in private lending, there are reasons for concern that a growing frac-The fraction of college graduates borrow- tion of youth from low-income and even ing less than \$10,000, including non-bor- middle-income backgrounds are unable to access the resources they need to attend college.⁶



At the same time, there are concerns that many recent students are taking on too much debt. Growing levels of debt, coupled with rising labor market uncertainty and the last recession have led to a sharp increase in student loan default rates after more than a decade of decline. Borrowers who are 270 days or more (180 days or more prior to 1998) late on their Stafford student loan payments are consid-



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He serves as co-coordinator of the Markets Network of the Human Capital and Economic Opportunity Global Working Group, an international research network devoted to studying issues central to financing human capital investment. He is also an editor at the *Journal of Labor Economics* and associate editor at the Journal of Applied Econometrics.

Lochner's research is largely devoted to the study of human capital formation throughout the lifecycle and to understanding criminal behavior. Previous and current research explores the interaction between human capital and criminal behavior; financial returns to schooling; human capital acquisition from birth to retirement; the evolution of earnings, skills, and inequality; and issues related to financing education, with a particular emphasis on the role of student loans.

Lochner received his Ph.D. in economics from the University of Chicago in 1998. He lives in London, Ontario, with his wife and nine-year-old daughter, and enjoys playing tennis, biking, and travel adventures with his family.





ered to be in default. Figure 2 shows make it likely that credit constraints than doubled between 2005 and 2011, years.⁷ Indeed, one in three full-time/ with default rates increasing most at full-year undergraduates in 2003-04 for-profit institutions and public twoyear schools.

Altogether, these trends raise two Can today's college students borrow enough? Or, are they borrowing too much? Growing evidence suggests that both concerns are justified, with important implications for the design of student loan programs.

Can College Students Borrow Enough?

that the rising costs and returns of college, coupled with declining real government student loan limits,

that two-year cohort default rates more have become more salient in recent exhausted their Stafford loan options.⁸ While many students have turned to private lenders for additional credit, seemingly contradictory concerns: the increased supply of private student credit was likely inadequate to satisfy the growing demands of many potential students. For example, private lenders typically require a co-signer for undergraduates, which leaves few alternatives for those whose parents have low income or a poor credit record.

Evidence on college-going further suggests an important increase in the extent to which credit constraints dis-Monge-Naranjo and I document couraged post-secondary schooling as default and deferment during the first over the 1980s and 1990s. My research few years after school. with Philippe Belley uses data from the National Longitudinal Surveys of Youth Baccalaureate and Beyond Longitudinal

to compare the relationship between family income and college attendance between cohorts completing high school in the early 1980s and the early 2000s.9 Consistent with previous studies,¹⁰ we estimate a weak relationship between family income and collegegoing for the earlier cohort. However, youth from high-income families in the later cohort are 16 percentage points more likely to attend college than their low-income counterparts, conditional on adolescent achievement and family background — roughly twice the gap observed for the earlier cohort. We further estimate that family income has become an important determinant of attendance at four-year (relative to two-year) colleges.

Uninsured labor market risk can discourage education in much the same way as credit constraints. Youth from low-income families may be unwilling to take on large debts to cover the costs of college when there is a possibility that they will not find good jobs after leaving school. By helping former students weather unexpected adverse labor market outcomes, explicit insurance mechanisms like unemployment insurance or student loan deferments and implicit insurance mechanisms such as the option to default on student loans can substantially affect the demand for credit and education.

Do Some Students Borrow Too Much?

An efficient student lending scheme should yield the same ex ante expected return from all borrowers even if ex post returns differ due to unpredictable labor market outcomes.¹¹ While the focus of considerable attention, default during the first few years following school provides only a limited picture of lifetime payments and expected returns to lenders, since many students cycle through repayment and nonpayment states such

Using data from the 1993-2003

Study (B&B), Monge-Naranjo and I analyze several different repayment and nonpayment measures to learn about the long-term expected returns/losses on student loans taken out by different types of college graduates.¹² Our analysis simultaneously controls for individual and family background factors, college major, postsecondary institution characteristics, student debt levels, and post-school earnings.

Our results reveal considerable differences in ex ante expected losses across borrowers from different backgrounds and across those choosing different college majors. Most notably, race is correlated with student loan repayment and nonpayment. Ten years after graduation, black borrowers owe 22 percent more on their loans, are 9 percentage points more likely to be in undergraduate debt than white borrowers. These significant gaps cannot of major, college type, or student debt levels.

While modest in comparison to differences between blacks and whites, there are also important differences in repayment or nonpayment across college majors. Students in engineering, health, and business programs perform well; humanities and social science majors perform relatively poorly. Differences in default by school type (public, private, for-profit) were insignificant for our sample of college graduates.

Although student debt levels and post-school income are both important determinants of repayment problems—an additional \$1,000 in debt can be roughly offset by an additional \$10,000 in income – differences in these factors explain surprisingly little of the observed variation in repayment/nonpayment rates by race and college major.

While rarely acknowledged, personal savings and family assistance can serve as important sources of insur-

influencing their post-school repay- measures of parental income when stument behavior. Combining administrative data on student loan amounts and for these other forms of self- and famrepayment with data from the Canada ily-insurance, suggesting that efforts Student Loan Program's (CSLP) to measure savings and potential fam-2011-12 Client Satisfaction Surveys ily transfers accurately offer tangible (CSS), Todd Stinebrickner, Utku benefits. Suleymanoglu, and I empirically examine the links between a broad array of **Designing Efficient Student** available resources — income, savings, and family support — and student loan repayment in Canada.¹³

rowers in their first two years of repay- design of student lending programs in ment were experiencing some form of an environment with uncertainty and repayment problem at the time of the common market imperfections that CSS. CSLP borrowers earning more limit the extent of credit and insurance than \$40,000 per year had non-pay- that can be provided.¹⁴ Efficient stument rates of only 2 to 3 percent, while dent loan programs must perform a difborrowers with annual incomes of less ficult balancing act. They must provide than \$20,000 were more than ten times students with access to credit while in nonpayment, and are in nonpayment as likely to experience a repayment school and help insure them against on roughly 16 percent more of their problem. These sizeable gaps remain adverse labor market outcomes after even after controlling for differences school; however, they must also proin demographic characteristics, educabe explained by differences in choice tional attainment, views on the conse- their income accurately, exert efficient quences of non-payment, and student levels of effort during and after school, debt.

Despite high nonpayment rates must also ensure that creditors earn an for borrowers with low post-school acceptable rate of return on their loans. income, more than half of this group Based on our analysis, we discuss continued to make their standard stuimportant lessons for the design of dent loan payments. Personal savings government student loan programs. and family support are crucial to under-For example, efforts to better equate standing this. Fewer than 5 percent of expected repayments across borrowers low-income borrowers with both sav- by linking borrowing limits to observings and family support experienced a able characteristics and educational repayment problem, compared to 59 choices can improve the efficiency of percent of low-income borrowers with lending programs and reduce default negligible savings and little or no fam- levels. Integrating the monitoring and ily help. Consistent with the hypothe- collection efforts with other governsis that savings and family transfers are ment collections (e.g. Social Security or important insurance mechanisms, we income taxes) can yield similar benefits find that the likelihood of repayment by reducing income verification and problems is unrelated to post-college repayment enforcement costs. earnings for those with modest savings We underscore the importance of and access to family assistance. By con-recognizing the response of private trast, among borrowers with negligible lenders to changes in public higher savings and little or no family assiseducation policies. Increased public tance, the effects of income on repay- investments in higher education may ment are extremely strong. This sig- be met with additional private student nals important gaps in the insurance lending if those investments improve provided by current student loan pro- post-college labor market opportuniance for some student borrowers, grams. Finally, we demonstrate that ties.¹⁵ More importantly, government

dents first borrow are a poor proxy

Loan Programs

In our most recent work, Monge-More than one-in-four CSLP bor- Naranjo and I consider the efficient vide incentives for students to report and generally honor their debts. They

loan programs that offer similar terms to borrowers of different ex ante risk levels may be undercut by private creditors, leaving government programs Washington, D.C.: U.S. Department with only the riskier borrowers.¹⁶

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¹² L. Lochner and A. Monge-Naranjo, "Default and Repayment among Baccalaureate Degree Earners," in B. Hershbein and K. Hollenbeck, eds., Student Loans and the Dynamics of Debt, Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, 2015, pp. 235-85.

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Determinants of Creativity and Innovation — Evidence from Economic History

Petra Moser

in human welfare. Yet, due to two major empirical challenges, it is dif- opera.³ ficult to determine the factors that encourage creativity and innovation. First, modern settings often lack clean experimental variation, because policies designed to encourage innovation adapt in response to lobbying, which makes it difficult to identify causal effects. Second, innovation and creativity are exceedingly hard to measure. For example, patent counts are the standard measure of innovation, innovations that occur outside of the patent system, for example in counsuch developments may distort economists' views on the determinants of innovation.

My research addresses these identification and measurement challenges by exploiting a wealth of historical events that changed intellectual property laws and other policies independently of changes in innovation. In practice, this research approach combines in-depth analyses of historical records with statistical tests of large data sets. For example, I exploit a the 19th century-before interest groups had begun to lobby for effects of patent laws on innovation. changes in patent policy — to analyze

Innovation and creativity are ect exploits variation in the timing of the primary source of improvements Napoleon's military victories to examine the effects of copyrights on Italian

Does Existence of a Patent System Encourage Innovation?

My research addresses a central question in economic history: Has the creation of property rights in ideas encouraged innovation and economic growth? A strong tradition argues that secure property rights built the foundation for the industrial revolution but they fail to capture important in Britain and the United States.⁴ Innovation is, however, a cumulative process and strong property rights for tries without patent laws. Excluding early generations of inventors reduce payoffs for those in later generations.⁵ These costs are particularly severe if patents are broad and their boundaries uncertain, so that later generations are continuously at risk of infringing on existing patents. Recent patent wars over smart phones and tablet computers have moved these issues to the forefront of policy debates, but the underlying tensions are more general. My research exploits historical variation in 19th century patent laws — when countries such as Switzerland and the large amount of credibly exogenous Netherlands had not yet adopted patvariation in national patent laws in ent laws or had abolished them for political reasons — to investigate the To measure effects on innova-

data on innovations with and with- tion. I construct historical data sets out patents that were exhibited at to capture innovations that occur world fairs.¹ Complementary research within and outside of the patent sysuses the Nazi's decision to dismiss all tem. Patent data fail to capture all Jewish scientists to examine the effects such innovations, which compromises of high-skilled immigrant scientists their use in empirical analyses of the on U.S. innovation.² Another proj- effects of patent laws. To address this



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Moser combines empirical methods from economic history and applied microeconomics to examine the determinants of technological innovation and artistic creativity. She has used historical variation in patent laws to examine the how patent policies can influence the rate and direction of technical change, as well as the geography of innovation. Her research also examines the role of human capital — in the form of high-skilled immigrant scientists-on innovation. New projects investigate the effects of copyrights on creativity in literature and music, and explore the link between mental disorders and innovation.

Moser received her Ph.D. in economics from the University of California, Berkeley, and an M.A. in international relations from Yale University. As an undergraduate, she studied economics, with minors in politics and European languages, at the University of Tübingen in Germany and as a Fulbright student at the University of Missouri.

Moser grew up in a tiny medieval town in Germany, close to the Moselle Valley, and still enjoys running the local hills. This summer, she and her family have moved to Brooklyn, and are excited to explore their new neighborhood, hot dog stands and all.