Access to Credit and Medical Decisions: Can Finance Save Lives?*

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Abstract

The poor often delay seeking medical treatment, even when it is free, to avoid losing income due to missed workdays. I use a regression discontinuity design to show that access to credit can remedy this issue. I exploit a setting in Korea in which individuals below a certain income threshold are eligible for cheap credit. My main finding is that such individuals have a 46% lower probability of dying or disability than otherwise similar individuals who are ineligible for cheap credit. This reduction is partly due to the fact that the eligible individuals see a doctor more promptly than the ineligible individuals after the onset of disease symptoms, as reflected in a lower likelihood of emergency room visits. Further, these individuals start treatment on average 62 days earlier following their initial diagnosis. Another major determinant of the decline in mortality and disability is that eligible individuals with chronic diseases are more likely to visit clinics for regular treatment. I explicitly show that such differences in the timeliness of treatment are due to individuals with access to credit being 44% more likely to take time off from work to seek medical care. Overall, access to credit can make a life-or-death difference to the poor even when medical treatment is affordable.

JEL classification: D14, G51, I15, I31

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1 Introduction

Taking time off for medical treatment often leads to a loss of income and workplace retaliation. And a significant portion of the workforce in most countries is employed in the informal economy, lacking a regular salary, severance, or sick leave.[1] These low-income unprotected workers often delay or refuse a hospital visit because of these opportunity costs. This paper demonstrates that access to credit, which enables households to avoid income-related delays in seeking health care, can have substantial health implications. Although a large body of literature documents that access to credit can improve health outcomes by helping people pay for health care (Cramer, 2020; Cutler and Vogl, 2011; Karlan and Morduch, 2010; Kopytov et al., 2021), I show that access to credit matters even when direct medical costs are negligible.

To provide causal evidence of the impact of access to credit on health outcomes via the opportunity cost channel, this paper exploits the unique settings in Korea. First, the Sunshine Loan, a government-backed credit program launched in 2010, provides subsidized credit to working individuals with annual incomes below a certain threshold. I use a regression discontinuity design around this income threshold to identify the impact of credit access on medical decisions. Individuals with incomes below the threshold are likely to be very similar to individuals with incomes above the threshold (ineligible individuals). Although all of the individuals in the sample have similar incomes within a narrow range, only individuals with incomes below the threshold (eligible individuals) have access to the subsidized loan. Second, direct medical costs are affordable in the Korean sample because Korean government provides universal healthcare through its National Health Insurance program. This program is quite generous, covering over 80% of the cost of inpatient care for the most expensive medical treatments. The direct medical costs is not likely to drive individual workers' medical decisions.[2]

I show that the eligible individuals for the Sunshine Loan are 44% more likely to take time off from work to seek medical care than the otherwise similar individuals. They seek for timely medical care and

[1]The Economist, "Asias workers cant afford to stay at home," April 18, 2020; Forbes, "Survey: Nearly 30% Of Americans Are Self-Employed," May 30, 2020; and International Labor Brief, Korea Labour Institute, May 2020.

[2]The empirical test on ex-post out-of-pocket (OoP) medical costs verifies that there is no significant difference on the direct medical costs between the treatment and control groups.

have a 25% lower probability of getting their diseases diagnosed in an emergency visit. Also, these eligible individuals are 23% less likely to present at a medical facility in a state of medical emergency. Even after their initial diagnosis, the eligible individuals begin treatment 62 days earlier, on average, than the ineligible individuals. Furthermore, eligible individuals with chronic diseases are 8% more likely to attend their regular medical appointments, which is a very important factor in treatment success.

I find that these differences in the timeliness of diagnosis and treatment have a very significant impact on overall health outcomes: eligible individuals are 46% less likely to die or suffer a disability, on average, than their ineligible counterparts. Thus, credit constraints can make a life-or-death difference to the poor, even in settings where direct medical costs are not relevant.

The Sunshine Loan Program, which is the core of this paper's identification strategy, was aimed to provide lower-interest personal credit loans to individuals who were previously excluded from the credit system. Most poor households do not have good credit ratings, disqualifying them from obtaining bank credit. The Sunshine Loans program offers a low interest rate that is less than half (on average) of the interest rate of the other loans available to poor households. In addition, the government guarantees 90-95% of loan amount, making banks more likely to extend credit to Sunshine Loan-eligible households. The Sunshine Loan Program restricts eligibility to households with low income or low credit. These eligibility requirements provide a clean institutional setting that enables me to study the causal impact of improving credit access.[3] I provide more details on the Sunshine Loan in Section 3.

The main data sets used in the paper are the Korea Health Panel Survey (KHPS) and the Korean National Survey of Tax and Benefits (NaSTaB). The KHPS provides individuals' detailed medical data with basic economic variables, and the NaSTaB provides financial variables on households income, expenses, and financial debt. Manipulation tests find no statistical jump of the running variable around the threshold identifying no systematic manipulation. Next, I use a regression discontinuity design to confirm that the individuals who are marginally eligible for a subsidized loan borrow more than those

[3] I do not have any information about the studied individuals' credit ratings, and thus I cannot differentiate individuals in the credit rating dimension. This results in the inclusion of some treated samples (higher income with lower credit rating) into the control group (higher income regardless of credit rating), and thus it underestimates (negatively biases) the treatment effect.

who are marginally ineligible. In addition, the sample shows a strong correlation between increased debt and inpatient care, although the change in medical expenses is economically trivial. This implies that the households that take on more debt tend to utilize inpatient care much more than other households, although the additional costs associated with that care are trivial. This finding is well in line with the hypothesis that households need subsidized loans to smooth their consumption dispite the negligible direct medical costs since the workers need to take time off from their work.

After these first-stage tests, I examine the impact of credit access on health outcomes. The main results show that the eligible individuals have a 12-basis-point lower probability of death or disability than the otherwise similar ineligible individuals in my sample. Given that the baseline is 24 basis points, better credit access can decrease the probability of death almost by 50%. The provision of Sunshine Loans only affects informal workers, not regular workers with paid sick leave or the non-working family members of the treated individuals. This suggests that the impact of the credit subsidy is indeed at work via the opportunity cost channel.

This impact might seem huge. However, a typical individual at the eligibility threshold in my sample is 45 years old and healthy enough to work. And this paper focuses on mortality and disability caused by disease only, excluding any accident. Most of these diseases causing deaths in my sample are categorized as either preventable or treatable diseases according to the OECD.[4] The survival rates of these diseases could easily be doubled or even quintupled just by early diagnoses. For example, lung cancer, one of the diseases that causes the most deaths in my sample, has a 5-year survival rate of 57% if it is diagnosed at an early stage but only 7% if it is diagnosed at a late stage.[5] The reasons for the dramatic improvement on medical outcomes are very likely that the eligible individuals utilize more medical services and seek treatment more promptly after the onset of disease symptoms than the ineligible individuals (Grinsztejn et al., 2014; Hawkes, 2019; Richards, 2009; Sud et al., 2020), as reflected in the eligible individuals' lower likelihood of emergency room (ER) visits (Kline et al., 2007).

[4]Avoidable mortality: OECD/Eurostat lists of preventable and treatable causes of death, Organisation for Economic Co-operation and Development (OECD), January 2022.

[5]United States Cancer Statistics (USCS), U.S. Cancer Statistics Data Briefs (No. 25), November 2021.

If individuals were to fully utilize medical services and seek treatment promptly after the onset of disease symptoms, a lower likelihood of emergency room visits and a lower likelihood of disease diagnosed during emergency visits would be expected (Kline et al., 2007). My results suggest that the eligible individuals are 23% less likely to be admitted to a emergency room and have a 25% lower likelihood of being diagnosed with a disease during an emergency visit cinoared to the ineligible individuals.

Even after a disease is diagnosed, a lack of access to credit can substantially delay the first treatment, which can be fatal for the affected patients (Grinsztejn et al., 2014; Sud et al., 2020). I find that a subsidized loan could shorten the delay between the first diagnosis and the first treatment by 62 days on average. This implies that the eligible individuals tend to *receive* medical care more promptly after the diagnosis.

Finally, I find that the eligible individuals with chronic diseases are 2.28% (or 0.24 more visits per year) more likely to receive ongoing care than the ineligible individuals with chronic diseases. Even after the initial treatment, access to credit plays a role in treatment continuation and ongoing medical attention.

A further test confirms that the individual with better access to credit (i.e., the eligible households) take more time off from work and utilize more of the inpatient care services at hospitals than the otherwise similar ineligible individuals. In addition, I further test whether the impact of access to credit on health outcomes arises from the opportunity cost channel. There is neither a statistically nor an economically significant difference in out-of-pocket medical costs between the eligible individuals and the ineligible individuals, which suggests that the direct medical cost channel is unlikely to be the main driver of the results. These results are consistent with the hypothesis that individuals use subsidized loans to smooth their consumption while they take time off from work to undertake necessary medical treatments.

In summary, my paper suggests that access to subsidized credit provides households with a financial buffer, allowing their members to stop work and receive necessary medical care on an ongoing basis. The better utilization of the medical system leads to a lower probability of ER visits, a lower chance of a

sudden or late diagnosis, a shorter delay between diagnosis and treatment, and a more regular medical care. Consequently, workers face substantially lower mortality threats from diseases when they have access to subsidized credit than when they do not.

The main contribution of the paper is two-fold. First, while many studies find that access to credit can improve households' health outcomes in general (Angelucci et al., 2015; Cramer, 2020; Hamid et al., 2011; Kopytov et al., 2021), but they are unclear about whether access to credit can improve health outcomes even when direct medical costs are trivial. I contribute to the literature by providing empirical evidence that credit access can improve individuals' health outcome via the opportunity cost channel. Second, this paper shows that access to credit plays a major role in health care utilization. Although many governments are moving toward providing subsidized, or even free, health care to low-income citizens, such care may not be effective if the poor are financially constrained. I show that many low-income individuals may not seek medical care because of the opportunity costs associated with doing so, despite national health policies that effectively subsidize health care.

The remainder of this paper is organized as follows. Section 2 summarized the related literature. Section 3 explains the institutional background of the Korean national health-care system and the Sunshine Loan program. Section 4 describes the data and provides summary statistics. Section 5 presents the main results. Section 6 concludes the paper.

2 Literature review

This study contributes to the literature that focuses on the impact of access to credit on health outcomes. Cutler and Vogl (2011) review the effect of household socioeconomic status on health outcomes. Improved financial access generally improves the health outcomes of households.[6] In addition, there is an extensive literature documenting how microfinance can improve the health outcomes of low-income households (Angelucci et al., 2015; Hamid et al., 2011; Jafree et al., 2021). These results support

[6]One notable exception is Cesarini et al. (2016), who find no impact of financial variables on health in Sweden, which tracks lottery winners. They argue that the causal effects of wealth are not a significant source of the wealth–mortality gradients in affluent countries that have extensive social safety nets. My study finds contrary evidence—that credit access could help poor households even with a high-quality universal health insurance system.

the importance of microfinance institutions in helping families to self-insure themselves against health shocks.

However, establishing the causal link between access to finance and health outcome is a challenging task. For instance, it requires ruling out omitted socioeconomic factors and resolving reverse causation issues. Recent empirical studies exploit various instruments and shocks to draw causal inferences. Cramer (2020) uses a policy that incentivizes banks to establish new branches in underbanked districts in India, finding that the households in the treatment districts have better health outcomes than those outside the treatment districts. Kopytov et al. (2021) propose a life-cycle portfolio choice model in which agents face cancer risks, but receiving treatment can be limited by borrowing constraints. They find that an increase in house prices leads to an increase in cancer survival rates, with a focus on the impact of mortgage access. My contribution is to show that access to credit improves health-care outcomes, even with a universal health-care system, via the opportunity cost channel. I identify the causal inference by exploiting a setting in which 1) direct medical costs are trivial because the studied individuals are covered by a universal health-care system; and 2) a threshold determines who has access to credit and who does not. Using this approach, I compare individuals around the eligibility threshold using a regression discontinuity design.

Another relevant literature focuses on how (micro-)finance can help households smooth their consumption after a health shock. Gertler et al. (2009) show that access to (distance from) microfinance institutions helps Indonesian families smooth their consumption following declines in their adults' health. Islam and Maitra (2012) also suggest that microcredit provides households with the ability to self-insure their consumption. They find that microcredit could prevent households from selling their livestock in response to health shocks, protecting them from significant long-term costs. Their studies support the proposition that access to credit could help mitigate the negative impact of a health shock. My contribution is to show that access to credit could lower the likelihood of a health shock itself.

This paper is also related to the literature that examines the links between households financial status and health insurance. Caswell and Goddeeris (2020) find that elderly households covered by Medicare obtain instant relief from their debts. The financial outcomes of low-income households affected by the

Affordable Care Act's Medicaid expansion and other similar reforms in the United States have improved dramatically (Mazumder and Miller, 2016). Without universal health coverage, health insurance and access to credit (debt capacity) are generally studied as substitutes in the literature. I find that access to finance and health insurance are complements, or alternatively, that they cannot be full substitutes due to opportunity costs. In this spirit, this study is related to research on universal health care. Recent studies argue that universal health care could dramatically improve health outcomes in the United States.[7] This study shows that universal health coverage might not be a panacea, and credit access could improve households health outcomes even under a universal health-care system.

More generally, this study extends our understanding of the impact of access to credit on household decisions. Many studies find that credit access has substantially positive effects on income, consumption, poverty, and labor market outcomes (Jack and Suri, 2014; Ji, 2021; Karlan and Zinman, 2010; Suri and Jack, 2016). The literature on the effect of credit on consumption smoothing supports the possibility that there are opportunity costs associated with medical treatment (Rosenzweig and Wolpin, 1993; Gertler and Gruber, 2002). This study extends the literature on the impact of credit access on health outcomes and emphasizes the importance of consumption insurance due to the opportunity cost of medical treatment. It is also related to studies investigating households suboptimal decisions under certain constraints. For example, many studies describe how scarcity affects individuals cognition and behaviors (Mani et al., 2013; Shah et al., 2012, 2015). The urgent need for labor income can restrict households attention or even affect their cognition and drive them to make suboptimal decisions focused on the short term.

The results of this study have implications for important policies, mainly universal health care. One important caveat is that I do not argue that credit access can replace universal health care. This study is not about replacing universal health care with credit access. Providing all people with access to essential health services without financial hardship is a key focus of the modern world's sustainable development goals. Governments usually attempt to achieve the access-to-care goal by lowering out-of-

[7] See Galvani et al. (2020) and Galvani et al. (2022). There are also pessimistic views on universal health care regarding implementation, costs, the philosophical issue of choice, and different opinions on single-payer systems (i.e., systems with a single national health insurer) (Hieb, 2004; Carroll and Ackerman, 2008).

pocket medical costs through the provision of universal health care. My aim is not to deny the impact of or need for universal health care. However, my results suggest that universal health care may not be effective if the poor are financially constrained due to the opportunity costs associated with medical care.

In this spirit, the final stream of related literature shows that socioeconomic variations significantly affect health outcomes. Thus, a policy of universal health coverage may fail to address the social determinants of health, which could limit the policy's impact on health outcomes (Bloom et al., 2018; Kim et al., 2018). Recent research focuses on various barriers to health coverage utilization, such as administrative capacity, informal payments and travel costs, quality of care, a chronic shortage of highly qualified staff, users lack of information about the potential medical benefits of treatment, distance from health facilities, and cultural issues (Abiiro et al., 2014; Banerjee et al., 2021; Bright et al., 2017; Chibwana et al., 2009; Saleh et al., 2018). I extend the literature by highlighting how access to credit can improve the effectiveness of universal health care.

3 Institutional setting

I begin by describing the National Health Insurance Service (NHIS), through which Korea covers much of the direct health-care costs of its population. Next, I describe the Sunshine Loan scheme, a government-backed subsidized loan scheme that only applies to individuals whose income is lower than a certain threshold.

3.1 National Health Insurance Service

The Korean government has provided a universal health-care safety net to citizens for a long time. The NHIS was founded in 2000 and combined all of the then-existing health insurance schemes into a single national health insurer (single-payer). As of 2022, 97.1% of South Koreas total population is under the NHIS Program, with the remaining 2.9% of the population covered by the Medical Aid Program. By law, all Korean citizens are enrolled in the NHIS, whereas the Medical Aid Program only extends to

the lowest-income households. The insurance system is funded by contributions, government subsidies, and tobacco surcharges.[8]

An important feature of the Korean health system is that medical treatment is relatively inexpensive for Korean citizens. The program covers up to 80%–90% of the costs of hospital inpatient care and roughly 50%–60% of outpatient costs (Song, 2009). According 2020 NHIS report, the overall coverage ratio was 64.2%, and the coverage ratios for the top 30 most expensive treatments averaged 81.3%. Most severe and common treatments, such as cancer and dental treatment, are well covered under the scheme, but cosmetic and selective medical treatments are not. According to the NHIS, most of the uncovered medical costs are additional expenses for a better inpatient room (single room), the expenses for the selective material (for the dental and bone treatments), and selective and cosmetic treatments.

Individuals can obtain additional private health insurance services in addition to their entitlements under the NHIS. However, the private insurance is uncommon in Korea and accounts for only 4% of aggregate health expenditures (Mathauer et al., 2009). The additional insurance typically provides a lump-sum payment if the insured is diagnosed with a specific disease or has an accident.

Concerns that NHIS coverage results in long wait times and poor treatment quality are not founded. For instance, the average waiting time for treatment in Korea is 2 days, with an average of 4.3 medical treatments per year.[9] In addition, the quality of the medical service in Korea seems adequate, given the low avoidable mortality rate. According to OECD Health Statistics 2021, the Korean avoidable mortality rate is estimated at around 144 deaths per 100,000 inhabitants, lower than the OECD average of 199.7 or the U.S. average of 265.

In 2015, South Korea ranked first among the OECD countries for the extensive coverage of its mandatory health-care system.[10] However, universal health-care does not seem to have eliminated the barrier between the hospital care and poor households. In a survey conducted by Kim (2007), around 27.2%

[8]As of 2022, the applicable contribution rate, including long-term care insurance, is 6.99% of the monthly wages; it is generally split equally between employers and employees at approximately 3.495% each. The employee contributions to the NHIS program are deductible in calculating taxable income.

[9]Korea Insurance Research Institute, A Study on Collaboration Strategies of Public and Private Health Insurance in the Korean Health Care System, 2014.

[10]Health at a Glance 2015, OECD Indicators.

of poor households with chronic diseases responded that they are not receiving the necessary medical care services, and 58.1% of them stopped their treatment due to the financial burden. Another survey suggested that almost half (49.5%) of poor households had given up the treatment due to the financial burden.[11] It is a puzzle that many poor households do not visit the hospitals even when the NHIS covers most of the medical fees. This study argues that opportunity costs of medical treatment play an important role. The immediate reduction in consumption for poor households when they take time off work deters them from seeking medical treatment.

In sum, medical treatment in South Korea is affordable and readily available. I exploit this wide and high coverage of the mandatory health-care system of Korea to test the opportunity cost channel. As the direct medical costs are relatively small, and the impact of private insurance is trivial, the main barrier against the a poor household receiving medical care is likely to be the opportunity costs.

3.2 Sunshine Loan scheme

A government-backed subsidized loan plan, the Sunshine Loan scheme, was launched in Korea on July 26, 2010. The program was intended to provide a lower-interest personal credit loan to individuals who were previously financially excluded and mostly relied upon private money lenders that charged high interest rates.

Before the Sunshine Loan scheme, banks in Korea excluded most poor households due to their poor credit ratings. The households without good (credit) ratings were left to borrow loan from saving banks and other financial institutions at interests rates that are on average above 20%; in 2012, the average interest rates from installments, saving bank credit loans, and lending company credit loans are 25%, 27%, and 30%, respectively.[12]

The Sunshine Loan scheme launched in 2010 offered interest rate that varies between 6% and 13%. The interest rates are less than half of the interest rate of the alternatives for poor households.

[11] "Half of low-income earners cannot go to hospital even if they are sick," Dailypharm (Korea), November 2009.

[12] "Borrow from the bank for your urgent needs: 10% interest micro/short loan first launched," The JoongAng, September 2012. In addition, the interest rate ceiling determined by the government was at 30% (unregistered financial institutions) and 49% (registered institutions), which makes it possible for the institutions to charge high-interest rates.

In addition, the loans made by banks and non-bank depository institutions to poor households are guaranteed by the Korean Credit Guaranty Foundation. The government guarantees 85%–95% of the total loans.[13] As the government guarantees the major parts of the loan, the banks are more willing to provide the credit to eligible households than otherwise. Thus, Sunshine Loan Scheme expanded credit availability to low income households at low interest rates.

According to the Korea Federation of Credit Guarantee Foundation, it provided 0.96 million people with KRW8.6 trillion (USD7.28 billion) solely via the Sunshine Loan scheme from July 2010 to December 2015.[14] In these first 5 years of the loan scheme's operations, 4.3% to 9.7% of eligible households had successfully utilized the scheme, which accounted for around 3.7% of the total labor force of Korea.

The Sunshine Loans can be applied to refinancing high-interest loans, personal consumption (livelihood loans), or business operations. The maximum loan amount depends on the purpose for which the loan is obtained. The scheme offers at most KRW30 million for refinancing, KRW10 million for livelihood loans, and KRW20 million for business operations. Given the annual income threshold for the loans was KRW20 million, the scheme could provide an individual a loan of 50% (livelihood loan) to 150% (refinancing loan) of their annual income. The program did not offer loans to start a new business explicitly. A substantial proportion of early issued loans were used to refinance high-interest loans. Subsequently, however, most loans were provided to support individuals' consumption. Until 2015, more than half of the issued loans (60.1%) belonged to the personal consumption (livelihood) category.

The scheme restricts eligible households to those with either low incomes or low credits. More specifically, the requirements are: 1) a household with a working history of 3 months or longer and 2) either an annual income below KRW20 million (USD17,000) or a credit rating worse than 6. The income threshold has been frequently lifted during our sample period from KRW26 million in 2011 to KRW30

[13]The ratio varies. For employees, the ratio started at 85%, increased to 95% in 2012, and settled at 90% in 2014. The loans to entrepreneurs or self-employed (farmers, freelancers, etc.) are guaranteed at 95%.

[14]The Korea Federation of Credit Guarantee Foundations (KOREG), "Achievements and Remaining Issues of Financial Support for the Low-income Class," March 2016.

million in 2014, and then to KRW35 million in 2017. However, the income threshold never crossed the median household income; thus, the scheme is primarily designed for low-income households.

These eligibility requirements of the Sunshine Loan scheme provide a clean institutional setting that enables us to study the causal impact of better credit access. An individual whose income is marginally lower than the income threshold has better credit access than a similar individual whose income is marginally higher than the threshold. This study investigates whether this exogenous variation in credit access affects individuals' medical decisions.

4 Data

The main data sets used in the paper are the Korea Health Panel Survey (KHPS) and the Korean National Survey of Tax and Benefits (NaSTaB). The KHPS provides data on individuals' detailed medical data with basic economic variables, and the NaSTaB provides financial variables on households' income, expenses, and financial debt. The main tests use the KHPS because it has detailed data on medical variables. However, because it does not provide any variables on financial debt, it cannot be used to conduct the first-stage test. Therefore, I use the NaSTaB data, followed by a similar sampling method, for the first-stage results.

4.1 Korea Health Panel Survey

The KHPS provides representative data on Korean individuals' medical and basic economic variables. It is an annual survey conducted by a consortium jointly hosted by the Korea Institute for Health and Social Affairs and the NHIS. The aim of the survey is to provide researchers with detailed medical data on service usage, out-of-pocket costs, uninsured medical expenses, over-the-counter drug spending, and other socioeconomic status variables. The KHPS is the most versatile data set to date in Korea for conducting multidisciplinary analyses and research on interactions between individual, social, and environmental elements of health care, with considerations for the dynamic, complex, and circular

structures of health-care expenditures. This data has been used in many medical studies (Choi et al., 2020; Nari et al., 2021; Park et al., 2016).

The KHPS is designed to be representative of Korean society. It uses 90% of the 2005 Population and Housing Census data as its sampling frame. Sample households are chosen through the following processes: 1) select sample districts (cluster) and 2) choose sample households in enumeration districts, using a probability proportionate and stratified cluster sampling method. With a total of 350 enumeration districts, the initial KHPS participants comprised approximately 8,000 households across the nation. The rationale for selecting so many cases is to account for attrition rates across time and to secure the appropriate number of cases for the analysis. The survey tracks 7,866 households starting from 2008, and 2,500 households were added in 2012 to maintain the representativeness of the survey based on the updated 2010 Population and Housing Census.

The main variables constructed from the data are as follow: 1) monthly income; 2) death identifier; 3) ER visit identifier; 4) diagnosis in an ER visit identifier; 5) delay between the diagnosis and the first medical treatment; 6) regular visit identifier of the patients with chronic diseases; 7) work stoppage identifier; 8) inpatient day (bed-day); and 9) out-of-pocket medical costs. As the data are obtained from a longitudinal survey, all observations are on an individual-year basis, except for the variable on the delay between the diagnosis and the first medical treatment, which is expressed as a proportion of the cases where a disease is diagnosed.

The monthly income variable is estimated using the annual income of the main job of an individual divided by the employed months from the individual income panel. The death identifier is constructed where a death is identified and its cause is a disease; these data are available in the individual information panel. ER visits are identified when an individual appears in the ER visit data panel. I exclude all ER visits that are for causes other than diseases, such as accidents. If the disease is first identified for an individual during an ER visit, I classify it using an identifier for diagnosis of a disease in an ER visit. To better identify the necessary visit to the hospital, I use the data which is dedicated to individuals

with chronic diseases. Focusing on patients with chronic disease, I take an average of the visit dummy variable.[15]

The work stoppage identifier in the KHPS panel is based on the survey question, "Have you been away from work due to the disease or damage in the previous month?" The inpatient day is an individual's total number of inpatient days in a given year. The delays between the initial diagnosis and the first treatment are in the units of days and I use only the case where an individual has been diagnosed with a disease during a medical check. Out-of-pocket medical cost is the total out-of-pocket medical costs of all outpatients, inpatients, and ER visits.

The income, out-of-pocket medical cost, delay (in days), and inpatient day variables are winsorized at the 99% level to exclude the effect of outliers. As the running variable used in the main specification is monthly income, I exclude all observations for which the income data are missing. As this study aims to test whether access to finance can effectively improve the health outcomes of individuals through the opportunity cost channel, I focus only on non-regular workers. Regular employees are generally legally protected with secured sick leaves, their wages are unlikely to be foregone, and they are not likely to be fired for taking sick leave. Finally, I exclude all observations right at the cutoff point (0) to prevent the potential noise caused by the rounding error due to the survey responses. The final sample consists of 39,566 individual-year observations with 12,055 unique individuals during the sample period between 2010 and 2018.

4.2 National Survey of Tax and Benefit

The NaSTaB provides detailed data on households' income, expenses, and financial debt. As the KHPS data set has no variable on financial debt, I present the first-stage results by relying on the NaSTaB following a similar sampling method. Both data sets base their sampling frames on the 2005 Population and Housing Census data, and they both follow two-stage cluster sampling based on the region (enumeration districts). One notable difference is that the NaSTaB has oversampled the high- and low-income

[15]Thus, it is no longer a binary variable. For example, if an individual with two chronic diseases regularly visits a clinic for a particular chronic disease but not for the other, the variable would have a value of 0.5.

groups (by 300 households each). However, as the primary methodology of this study is regression discontinuity with a threshold close to the middle-income group, this oversampling of the two edges is unlikely to make much difference to the results.

The main variables constructed from the data are as follows: 1) household minimum monthly income; 2) financial debt; 3) medical expenses; 4) a medical care usage dummy; and 5) an inpatient care dummy. The household minimum monthly income variable is the minimum monthly wage of the household members in the year. The financial debt is estimated by summing two financial debt variables: financial debt from banks and other credit loans provided in the NaSTaB database. The medical expenses are estimated using medical expenses variable. The medical care usage and inpatient care dummies are directly estimated from the dummy variables in "existence of medical expense" and "existence of inpatient care expense."

The income, debt, and medical cost variables are winsorized at the 99 percentiles to exclude the effect of outliers. Again, I exclude all of the observations for which income data are missing. The final sample consists of 25,185 household-year observations with 4,395 unique households during the sample period between 2010 and 2018.

4.3 Summary Statistics

The summary statistics of KHPS are presented in Panel A of Table 1. The average monthly income is KRW1.720 million, which is around USD1,300. This is lower than the national average, and the average of the KHPS data, primarily because I restrict the sample to non-regular workers. My sample includes only self-employed (freelancers, farmers, fishers, etc.), daily workers, and contract workers, and their wages are generally lower than those of regular workers. The running variable, income over the threshold, has an average of -KRW0.639 million (around -USD480). There are 30,541 individual-year observations (77.19%) with 9,937 unique individuals in the treatment group (with negative values for the running variable) and 9,025 individual-year observations (22.81%) with 3,960 unique individuals in the control group (with positive values for the running variable). The mortality rate of the sample is

7.1 (per 1,000 inhabitants), which is slightly higher than the national rate of 6.2 (per 1,000 inhabitants). Again, this may be due to the focus of my sample on low-income and unsecured workers. The probability of an ER visit is 4.91% in the sample, out-of-pocket medical costs average KRW370,400 (around USD280), and the monthly probability of work stoppage is 2.36%. Though not presented in Table 1, there are two variables tat are not at individual levels: delays between diagnoses and treatments and care for chronic diseases. On average, there are 90 days between diagnoses of diseases and their first treatment. And per chronic disease, 69.6% of households regularly visit the medical institution to care for their conditions. On average, an individual in the sample spends 1.623 days in hospital per year; this increases to 12.76 days among those who received inpatient care.

– Insert Table 1 here. –

Also note that I have excluded all of the deaths with non-disease causes (accidents) or for which the reasons are unspecified. The detailed data make it possible for me to investigate the causes of death in depth. The exact causes of death following the KCD 6-digit codes are presented in Figure 1. The most common cause is cancer (115 cases, 36.62%), followed by diseases related to the circulatory system (84 cases, 26.75%).

– Insert Figure 1 here. –

The summary statistics of NaSTaB are presented in Panel B of Table 1. The household average monthly income is KRW2.680 million, which is around USD2,000. This is higher than that in the KHPS data set, which is restricted to non-regular workers, but similar to the Korean population average. The eligibility depends on whether the income of any household member is lower than the threshold, and thus, I use minimum monthly household income to identify the eligibility. On average, the minimum monthly household income is KRW2.371 million (around USD1,800). The running variable, income over the threshold, has an average of -KRW0.010 million (around -USD7.5). The average debt outstanding is KRW6.327 million (around USD5,000). In total, 15.7% of the households reported holding credit debts. The average medical expenses are reported to be KRW1.348 million (around USD1,000).

One caveat here is that I cannot identify whether this expense includes covered fees and/or insurance fees. A total of 15.5% of the households report that they have received inpatient care during the year.

4.4 Manipulation Test

The Sunshine Loan program has transparent rules that tie eligibility to wages and credit ratings, with the requirements reflecting clear cutoff values. Those with wages below the cutoff, or with credit ratings worse than the cutoff, are eligible for the loans, and those with wages and credit ratings above are not eligible. The question is whether individuals who satisfy eligibility conditions for the Sunshine Loan show different medical/health outcomes compared with otherwise similar individuals who are ineligible because they do not meet the loan criteria.

My setting must ensure that the treatment assignment is randomized around the threshold that determines eligibility for Sunshine Loans and that individuals who are just below the wage threshold are similar to those that exceed the threshold. In other words, individuals with incomes just above the cutoff (not eligible for the loan) provide a useful comparison group with those just below the cutoff (eligible for the credit). Unfortunately, neither the KHPS nor the NaSTaB data set provides any information on credit ratings, and thus I cannot differentiate the individuals on that dimension. This will result in mixing some treated samples (higher income with worse credit ratings) into the control group (higher income unconditional on credit ratings), which means that the estimated treatment effect is underestimated.

In this subsection, I provide a statistical test on the potential manipulation around the cutoff. If an individual could precisely manipulate their income around the threshold, the density of observations just below the cutoff (eligible for the subsidized loan) should be higher than those just above the cutoff (ineligible for the subsidized loan). The setting would be invalid if it was indeed possible to manipulate income to be assigned to treatment (McCrary, 2008). To alleviate these concerns, I follow Cattaneo et al. (2020) to test for discontinuity in the density test and present the distribution of the running variable (i.e., income over the threshold).

– Insert Figure 2 here. –

Figure 2 depicts a simple histogram of the monthly income distribution and the results from the manipulation test using local-polynomial density estimation. The x-axis measures the income over the threshold, and the y-axis measures density. The monthly income is expressed in units of KRW10,000 (the original unit of the data, which is around USD7.5). The bluish-gray bars are the histogram with a width of 500, and the estimated density plots are shown by blue (treatment) and red (control) lines. The gray area presents the 95% confidence interval. The left and right figures plot the tests using the NaSTaB and KHPS samples, respectively, and the estimated test statistics are 0.2893 (p—value of 0.772) and 1.385 (p—value of 0.166), respectively. The manipulation test suggests that there is no statistical evidence of systematic manipulation of the running variable.

5 Results

The paper studies whether access to finance improves the health outcomes of individuals through the opportunity cost channel. The empirical tests are set in Korea, a setting where direct medical costs are largely covered by the country's universal health-care system limiting the effect of the direct cost channel. To draw a causal inference, this study uses eligibility for the subsidized loan scheme, the Sunshine Loan, as the relevant instrument.

The main empirical specification is the regression discontinuity design, following Calonico et al. (2014). The eligibility requirements for the Sunshine Loans introduce a clear cutoff, and the main goal of the study is to investigate whether there is a clear jump on the outcome variable around this cutoff. I use the software package developed by Calonico et al. (2017), and the specific parameter choice of the empirical design is a local constant (zero polynomial) using a triangular kernel, with the optimal bandwidth selected following Calonico et al. (2020), and controlling for the age groups and disease categories.

There are 19 age groups, beginning with individuals below the age of 10 years, then proceeding in blocks of 5 years (e.g., 10–15 years, 15–20 years, and so on) up to 80–85 years, and finally 85 years and above. The disease categories are based on the Korean Classification of Diseases (KCD) letter codes.

According to this classification, diseases are categorized into 23 disease types[16] As some main outcome variables of interest are binary variables with extremely low averages, I force the program to require at least 300 unique observations in the preliminary bandwidth to estimate the results with sufficient variation.[17] The results remain qualitatively similar without the 300 observations constraints.

In addition to the main results, I provide the results on binary outcome variables following Xu (2017) in Table A1. The approach of Xu (2017) is meaningful because nonlinear transformations are natural for binary outcome cases. However, there is not yet a fully developed econometric technique available to control a set of important covariates (age groups and disease categories in this case). Therefore, I retain the conventional method for the main specification, but provide the results following this approach as a robustness check.

5.1 Credit Borrowing

First, I conduct a set of tests that verify the first-stage results that eligibility for the Sunshine Loans does indeed increase the borrowing of households. If the launch of the Sunshine Loan scheme had only a trivial impact on the actual borrowing of the households, it would be unlikely that any result based on the use of such an instrument operated via access to credit.

I follow the specifications set earlier to test the impact of access to subsidized loans on the actual borrowing of the households, with the results shown in Table 2.

– Insert Table 2 here. –

The results show that treated households eligible for the Sunshine Loans tend to have a 16% greater chance (2.66 percentage points) of obtaining credit and are 29% more likely (2.88 percentage points) to

[16]They are: infectious diseases; viruses and infections; cancers; neoplasms and blood; endocrine, nutritional, and metabolic; mental and behavioral; nervous system; eyes, ears, and adnexa; circulatory system; respiratory system; digestive system; skin and subcutaneous tissue; musculoskeletal system and connective tissue; genitourinary system; pregnancy, childbirth, and the puerperium; perinatal period; congenital malformations, deformations, and chromosomal abnormalities; symptoms, signs, and abnormal clinical and laboratory findings; traumatic; injury poisoning and exogenous; codes for special purposes; factors influencing health status and contact with health services; and other unclassified.

[17]An exceptional parameter (30) is applied to the days between the diagnosis and the first medical treatment because it has a much smaller sample size (2,909 cases).

increase their outstanding debt. The amount of debt of treated households is 18.16% higher compared with the control group, ineligible for the Sunshine Loan scheme, and the percentage changes show a 25.20% more increases in their debt. These results consistently show that the launch of the Sunshine Loan scheme did indeed introduce a discontinuity around the eligibility threshold, and that those who are eligible for the program are granted better access to credit than those who are ineligible. In Table A2 in the Appendix, I provide a set of robustness tests using two additional bandwidths that are 10% higher and lower than the baseline bandwidth.

Next, I investigate how borrowing and medical decisions interact. Table 3 reports the differences in the medical decisions conditioned on households' debt increases. Households make more use of medical care when they take on more debt. Comparing the households with increased debt with the other households, the households with increased debt are 2.72% (2.54 percentage points) more likely to receive medical services, and 31.84% (4.83 percentage points) more likely to receive inpatient care. Moreover, these households spent only KRW79,000 (around USD60) more on medical expenses than the control households.

– Insert Table 3 here. –

Only inpatient care is economically significant among the three outcome variables. Although households take more general medical care and spend more on medical expenses statistically after increased access to credit, the magnitude of the changes is somewhat trivial. However, inpatient care is economically and statistically significant. This fits well with the study's hypothesis because inpatient care means more time in hospital with substantial opportunity costs.

The results of Table 3 can be summarized as that households who have taken on more debt tend to exhibit a much higher probability of using inpatient care (vs. those with poor access to credit). Interestingly, the estimated difference in medical costs are small (roughly one-day-wage at the minimum wage rate). Thus, increases in medical expenses are not likely to be a major barrier to the use of care, even for low-income households. However, the household did take 15% more debt at the same time. It is likely that the inpatient care is associated with substantial opportunity costs. And the households might

have needed the extra credit to fund these opportunity costs. For example, inpatient care potentially means a stoppage of work and the immediate and potentially lasting disruption of the household's consumption. Therefore, the household needs credit to smooth consumption.

In summary, this subsection verifies the first-stage mechanism; that is, that the treated households are taking on more debt. More importantly, it shows that obtaining debt is correlated with utilization of inpatient care even though the additional associated costs are trivial. These results imply that households use subsidized loans to smooth their consumption and undertake necessary medical treatments.

5.2 Mortality Rate

This study investigates whether access to subsidized loans impacts individuals' health outcomes. More specifically, mortality and disability rates are used in this subsection to examine health outcomes. The rationale behind this is that households might delay or even give up on medical treatment due to the opportunity costs increasing the possibility of death and disability.

Providing causal evidence of the impact of access to credit on health outcomes via the opportunity cost channel is a difficult task for two reasons. First, access to credit is endogenous, as it is often correlated with other socioeconomic variables that directly impact health (Cutler and Vogl, 2011). Poor health in itself could result in reduced income and credit constraints (Khera et al., 2018; Zheng et al., 2019), leading to reverse causality. Second, even if credit access was observed to lead to better health outcomes, it would be difficult to identify the extent to which this result would arise from opportunity costs rather than from direct medical costs of the type studied in the past.

For these reasons, the ideal setting to study this issue is one in which a random sample of people is granted access to credit in an environment where direct medical costs are negligible. This paper's setting where Sunshine Loan, a government-backed credit program in Korea, provides subsidized credit to working individuals with annual incomes below a certain threshold, approaches this ideal. My identification strategy relies on the fact that individuals with incomes below the threshold are likely to be very similar to individuals with incomes above the threshold (ineligible individuals). Although all of

the individuals studied have incomes within a narrow range, only individuals with incomes below the threshold (eligible individuals) have access to a Sunshine Loan. The variation in credit access among the studied individuals is almost random, helping to address endogeneity concerns.

– Insert Figure 3 here. –

Figure 3 depicts the scatter plots (averaged within bins) with the local constant lines on the deaths caused by diseases. The horizontal axis measures income over the loan threshold, and the vertical axis shows the residualized outcome variables after controlling for the age groups and disease categories. The results on deaths caused by diseases are shown using a local constant (zero polynomial) using a triangular kernel with a bandwidth of KRW1 million (USD750) monthly.

The figure shows a substantial positive jump in the mortality rate at the cutoff. This implies that an individual with better access to finance has a lower mortality rate (around 10 basis points) than an otherwise similar individual without access to the subsidized credit loan. Given the sample averages for two outcome variables are 7.1 basis points, the estimated jumps are economically significant.

Next, the study follows a standard regression discontinuity test to investigate the local average treatment effects (LATEs) of better credit access (eligibility for the Sunshine Loans) on household health outcomes. Table 4 presents the mortality rate results.

– Insert Table 4 here. –

In Table 4, I present the estimated LATEs for the optimal bandwidth estimated, following Calonico et al. (2020). I provide a set of robustness tests using two additional bandwidths (10% higher and lower) in Table A3 of the appendix. As specified above, LATEs are estimated using a local constant (zero polynomial) with a triangular kernel controlling for the age groups (5-year-widths) and 23 disease categories.

Column (1) of Table 4 shows that the impact of access to subsidized credit on the mortality rate due to diseases is, on average, around 10 basis points. The estimated impact remains qualitatively unchanged

after controlling for the age and disease groups. Since deaths are rare events in my sample, I conduct the same test on the dummy variable which equals to 1 if an individual dies or suffer any disability due to a disease. The results are presented in Column (3) and Column (4). The impact is economically large, given the conditional mortality rate of the control group using the optimal bandwidth is 16-24 basis points. In other words, an individual whose income is marginally lower than the loan threshold (i.e., they are eligible for the loan) is 45-70% less likely to die or to suffer a disability due to disease than an individual whose income is slightly higher than the threshold (and therefore ineligible for the loan).

Although I confirm that there is no manipulation of income to meet the threshold in Subsection 4.4 and verify the first-stage results in Subsection 5.1, an issue with the main results may remain. First, the main results cannot identify whether the impact operates through the opportunity cost channel. Instead, the general benefits of credit access might have driven the results. The treatment group has been provided with better credit access than before, which would naturally improve the general well-being of the treated households. Furthermore, this general improvement itself might have caused the decrease in mortality rates. Second, there could be concerns of type I errors, where a mechanical problem falsely identifies jumps regardless of the threshold.

– Insert Table 5 here. –

I first provide the results using the regular worker sample to mitigate those concerns. The same eligibility rules apply to regular workers, but they are less likely to suffer opportunity costs because the labor laws secure them sick leaves. Column (2) shows that the impact is less than a third compared with the main result for the non-regular workers. This verifies that the impact of providing a subsidized loan is substantially smaller (larger) for those who are less (more) likely to suffer from the opportunity costs. It implies that the main result is likely to be at work via the opportunity cost channel.

Second, I provide a test using the non-working household members of the treated individuals in Column (3). This test mitigates the concern that the impact is driven by the general benefits from credit access since the benefit is available to all household members. The estimated impact is less than one fifth

of the main result, suggesting that it is not likely that the general improvement of household well-being causes the decrease in the mortality rate.

Finally, in Column (4), I report a final placebo test using a false threshold of KRW1 million (around USD750) below the true threshold. The placebo test shows no statistically nor economically significant jump around the false cutoff. This implies that the main result is not likely to be caused by a false positive for various mechanical reasons.

An important note is that not many of the deaths in my sample are sudden. Most of the deaths are caused by diseases that were diagnosed earlier, which implies that many are curable or even preventable if treated early. For example, one of the most fatal diseases that caused the most deaths is gastric cancer. According to the American Cancer Society, the 5-year survival rate for gastric cancer is 70% (early stage, localized), 32% (later stage, regional), and 6% (latest stage, distant).[18] With regular visits and earlier treatment, individuals can effectively lower their mortality rates. A huge stream of medical literature emphasizes the importance of early diagnosis and treatment (Coleman et al., 2011; Hawkes, 2019; Williams, 2004). Thus, encouraging poor households to visit a hospital early and regularly is important.

Given that early treatment and diagnoses are relatively cheap with universal health care, the direct medical costs should not be the main barriers. In the following subsection, I investigate whether providing a subsidized loan can help low-income households present to hospital earlier and more regularly than they would otherwise.

5.3 Emergency Room Visits, Delays, and Regular Visits

Today, many diseases are curable or at least treatable. And the main driver of differences in the mortality rate is often the timing of the diagnoses and treatments. Many medical studies support that late diagnoses and late treatments drive mortality (Grinsztejn et al., 2014; Hawkes, 2019; Richards, 2009;

[18]However, the dataset lacks variables which survey the individuals disease symptoms nor severity of the disease for me to conduct a direct test making use of disease symptom.

Sud et al., 2020). If a household member had been diagnosed with a disease in an earlier stage and treated without delay, there is a high likelihood that the disease would not have been fatal.

Unfortunately, I do not have a variable that directly measures the severity of the disease on the patient's first visit to hospital. Thus, I use emergency room (ER) visits as a proxy. If a household has been regularly visiting a clinic, it is likely that they can avoid a situation that requires an ER visit (Kline et al., 2007), and it is less likely that they will get diagnosed with a disease upon an ER visit than if they are not visiting a clinic regularly.

– Insert Figure 4 here. –

Again before a proper empirical test, I visually present the impact of access to the subsidized loan on the ER visits in Figure 4. Similar to Figure 3, the figure is depicted using a local constant (zero polynomial) using a triangular kernel with a bandwidth of KRW1 million (USD750) monthly on the residualized ER visit identifier after controlling for the age groups and disease categories. The figure shows a jump of around 0.9% at the cutoff, and it is economically significant given the sample mean of 4.91%.

– Insert Table 6 here. –

Table 6 presents the estimated results of the regression discontinuity test, again using the optimal bandwidth estimated following Calonico et al. (2020), and using the same specification as Table 4. The first column shows that the impact of access to subsidized credit on the ER visits due to diseases is, on average, around 1.25 percentage points. These results imply that an individual eligible for the Sunshine Loan scheme is 22.89% less likely to visit the ER due to disease than an individual who is not eligible for the Sunshine Loan scheme by just a margin. In other words, the results suggest that an individual who lacks credit access is more likely to be brought into the hospital in a more severe condition than their counterpart with credit access.

The second column shows the result of the late diagnoses in an ER visit. The result suggests that, on average, the impact of eligibility on late diagnoses is 1.01 percentage points, which implies that a

household member with better credit access is 25.31% less likely to be diagnosed with a disease in an ER visit. In other words, an individual with limited credit access might delay medical care and end up with a late diagnosis upon an ER visit.

These results are closely related to the main results. Figure 5 graphically shows how critical it is to get diseases diagnosed in regular walk-ins. All five fatal disease categories show significant jumps in mortality if the disorders are first diagnosed during ER visits. The figure suggests that checking the symptoms and diagnosing the diseases early can substantially lower mortality rates. I find that the correlation between late diagnoses and mortality can explain around 27% of the main treatment effects on the mortality rate.

– Insert Figure 5 here. –

Next, I test whether there is any difference in medical treatment delays between the control and treatment groups. An individual might delay medical treatment due to opportunity costs because they are unable to leave work to receive treatment due to the anxiety caused by the prospect of immediate consumption cuts. Here, I screen the cases in which a household member is diagnosed with a disease upon a regular check-up, and I measure the days between the diagnosis and the recorded first treatment.

The results are shown in Column (3) of Table 6.[19] It shows that access to subsidized credit can shorten the delay between diagnosis and treatment by around 62 days. Given the sample mean of 146 days, the impact is certainly non-trivial.

The delay does vary greatly depending on the disease involved, although I do not observe any considerable differences in the delays for the most severe illnesses, such as different types of cancer. However, many chronic diseases, such as hypertension and ulcers, do show considerable variations in the delays between diagnosis and treatment. Not surprisingly, these delays can be fatal (Søreide et al., 2015; Williams, 2004). In my sample, the correlation between this delay and the mortality rate explains 37% of the impact of the subsidized loan scheme.

[19]The results are estimated using similar parameter settings to those presented in Table 4, with the only difference being that I lower the restriction on the number of unique observations in the preliminary bandwidth (30) because there are far fewer observations in this case.

Finally, I conduct a test to check whether access to finance affects the medical decisions of patients with chronic diseases. Chronic diseases are long lasting (1 year or more) and require ongoing medical attention. Heart disease, cancer, and diabetes are typical examples of chronic diseases. Given the characteristics of these diseases, it is recommended that patients visit hospitals regularly.

The results are shown in Columns (4) and (5) of Table 6. They show that access to the Sunshine Loan scheme increases the probability of regular visits by 2.8 percentage points and 0.24 visit counts. The increases do not seem substantial compared with the corresponding baseline figures of 63.13% and 2.99, respectively, as the estimated impacts are around 3.6% and 8.0%. However, the data suggest that these differences are crucial for the survival rates of the patients. The correlation between the visit counts and mortality rate explains another one third of the main impact.

In summary, the results of this subsection suggest that individuals with better credit access tend to have a lower probability of ER visits, shorter delays between diagnoses and treatments, and a higher probability of regular visits in the case of patients with chronic diseases compared with their counterparts with poor credit access. Given the importance of these variables in affecting the mortality rate, the results explain how credit eligibility affects the households' medical decisions and improves health outcomes.

5.4 Work Stoppage, Days in Hospital, and Direct Medical Cost

This subsection investigates household decisions on their time allocation to identify the impact of subsidized loans via the opportunity costs channel. I also test whether the treatment and control groups exhibit different patterns of work stoppage, inpatient care (days in hospital), and direct medical costs (out-of-pocket medical costs).

I argue that the eligibility for the subsidized loans allows low-income households to smooth their consumption, stop work if required, and receive medical treatments if there is any medical need. If this channel is operating, I expect to observe more work stoppages and more inpatient care among the households eligible for the subsidized loan compared with the ineligible households.

In Table 8, I test whether access to credit encourages individuals to pause work for medical treatment. If access to finance operates on medical access and outcomes through the opportunity cost channel, the treatment group would be expected to experience more work stoppages and tend to stay longer in hospital than the control group.

– Insert Table 8 here. –

The first column of Table 8 presents the results for work stoppage. The outcome variable is a survey question: "Have you been away from work due to disease or damage in the previous month?" The estimated impact of better access to credit is around 0.91 percentage points. Given the sample mean of 2.08%, the economic magnitude is not trivial. In addition, as the survey question is based on monthly behavior, the equivalent annualized impact could be around 11 percentage points. Overall, therefore, access to the subsidized loans did indeed encourage households to stop work for medical/health reasons.

Do households use these work stoppages to visit and stay in the hospital? Columns (2) and (3) of Table 8 show the results of the inpatient care dummy and the days in the hospital. The LATEs are estimated to be 1.39 percentage points and 1.7 days. Again, the economic magnitude is substantial given the baseline of 11.04% and 1.10 days. Thus, these results confirm that members of the households are more likely to visit and stay longer in hospital if they have been provided with better credit than other households.

Finally, I empirically test whether access to a subsidized loan affects out-of-pocket medical costs. Although universal healthcare in Korea covers a significant proportion of the costs with comprehensive coverage of diseases, it is still possible that out-of-pocket medical costs are the primary barrier to medical treatment. If so, the study's main findings could be driven by the direct cost channel, and one would expect the out-of-pocket medical costs to be substantially higher for the treatment group than for the control group.

The last column of Table 8 presents the results, which indicate that there is no statistically significant jump at the cutoff. Moreover, the economic magnitude is relatively small at KRW27,000 (around USD20) per year; even for low-income households on minimum wages, it is no more than 3 hours' pay.

The study's empirical findings can be summarized as follows. This study uses the institutional settings in Korea and finds that the treated households whose income is marginally lower than the threshold for a loan scheme (and who are thus eligible for a subsidized loan) tend to exhibit lower mortality rates than the controlled households whose income is marginally higher than the threshold (who therefore are ineligible for the subsidized loan). As there is no statistically and economically significant jump identified for the out-of-pocket medical cost, it is likely that the impact occurs through the opportunity cost channel rather than direct cost channel. Indeed, the treatment group tends to have a lower probability of ER visits, a shorter delay between diagnosis and treatment, and a higher likelihood of regular visits to treat chronic diseases compared with the control group. Furthermore, the findings suggests that the treatment group tends not to delay medical treatment and can thus can better manage or control their diseases. Finally, the treatment group experiences more work stoppages (or sick leaves) and stays longer in the hospital than the control group.

Even in a society with a universal healthcare system where out-of-pocket medical costs are not likely to be the main driver, credit access can still improve households' health outcomes via the opportunity cost channel. My results imply that providing direct and free health services to the low-income population may not be enough to prevent adverse health outcomes when opportunity costs matter greatly in seeking treatment. Even though health care is free, individuals may not still access it because doing so imposes opportunity costs of lost wages and reduced ability to earn income in the future. Visiting clinics or receiving medical treatment also uses up individuals' time. Unfortunately, many poor workers cannot afford to be away from work due to limited liquidity and savings. This paper finds that access to finance can effectively mitigate such problems. If a household with a liquidity constraint can access credit loans, they might rely on credit to reduce opportunity cost and therefore opt to receive proper medical treatment.

5.5 Additional Tests

In addition, I test whether the impact of credit access varies on some individual characteristics. The theory behind this is to test whether the impact of credit access varies on the potential opportunity

costs. If a certain characteristic implies a higher opportunity cost, the impact of credit should be higher for individuals with this characteristic. I conducted the tests on the impact of credit access on work stoppage for gender, job characteristics, and family structures.

The results are shown in Table 9. The impact of credit access is much more substantial for individuals with children and individuals employed in low-skilled industries. These results are in line with the hypothesis that impact of better credit access should be stronger for those individuals with higher opportunity costs. Because individuals with children might have stronger incentives to smooth their consumption for the whole family, thus, the opportunity cost of missed workdays are higher. The low-skilled workers are more likely to be replaced and thus, might have higher opportunity costs due to higher unemployment risks. One puzzling finding is that the better credit access only affects male in my sample. It is possible that the female might face a very different constraint (e.g., gender discrimination), and even a subsidized credit access might not able to mitigate the issue.

– Insert Table 9 here. –

Next, I try to investigate the reason for individuals' sub-optimal decisions. It is possible that individuals make sub-optimal decisions due to either limited rationality (myopia) or limited information. The delay of medical treatment can be caused by individuals' myopia. They may not seek medical treatment due to the fact that they value the long-term health benefit not as much as the short-term decrease in consumption similar to the findings of Thaler et al. (1997). However, it may also be possible that individuals do not seek timely treatment due to limited information. They might underestimate the medical benefit due to the lack of information. If the full information was available, they would fully utilize the medical system to improve their health outcomes.

I try to investigate these issues studying the impact of access to credit for two sub-samples of individuals: 1) sub-sample by age: individuals before the age 40 and individuals that are 40 years old or more; and 2) sub-sample by chronic diseases. If myopic behaviors are at work, the young individuals should be affected more by better credit access more since they might underestimate the long-term health benefits. On the contrary, the elders would find the benefit of medical treatment less remote,

and thus, they would have a lower barrier to visit hospital over to go to work. In other words, elder individuals' medical decisions would be less sensitive to credit access. Chronic disease patients are aware of their diseases and are likely to be better informed of their medical benefits of getting treated. If the information channel is at work, I expect the well informed group utilizing their medical system more than the other. If the information channel is at work, the medical decisions of the better-informed group (chronic patients) would be more sensitive to the credit availability (fully utilizing the medical service).

– Insert Table 7 here. –

Table 7 reports the results. The column (1) through (4) test the implication of myopia and column (5) through (8) test the implication of information. The results suggest that individuals of different ages act differently. The younger individuals are more affected by the subsidized credit while the elder individuals are affected substantially less. This provides a circumstantial evidence for the myopia channel. Since the younger individuals are likely to find long-term health benefit less valuable, their medical decision (pausing their work and going to hospital) is more sensitive to the availability of credit which smooths short-term consumption. However, the impact on mortality risk is not trivial. Although not statistically significant, the impact on the health outcome for the younger group is very large (80%), which suggest that if younger individuals do not delay seeking medical treatment, they can effectively reduce the mortality risk due to diseases. Also, though not significant, the impact of credit access for elder individuals is also not economically small suggesting that credit access still plays an important role.

Next, the results suggest that individuals with chronic diseases are affected substantially more by better credit access. These results suggest that the individuals of the better-informed group (chronic patients) tend to pause their work more often to seek medical treatment. I find no impact of credit access for individuals without chronic disease. It suggests that individuals without chronic diseases do not make full use of credit availability in terms of higher medical service utilization. These results are in line with the information channel hypothesis.

To conclude, I find some suggestive evidence for both myopia channel and information channel. The younger individuals' medical decisions are more sensitive to credit availability and the individuals being aware of their diseases tend to make full use of credit to seek medical treatment.

Also, I try to quantify the benefit of access to credit in seeking early treatment. More specifically, I try to answer how much of the delay in seeking treatment is due to credit being costly versus how much is due to credit being unavailable. I conduct a back-of-envelope calculation and it suggests that if an individual finds that benefit of medical treatment is less than labor income of 19 days, she will optimally go to work delaying the hospital visit. If she finds that the benefit exceeds 19 days' income, she will choose to go to hospital only when she has access to subsidized credit. However, she would further delay the treatment if she doesn't have access to Sunshine Loan. She would go to hospital only if the estimated benefit of hospital visit exceeds much higher value (29 days' income).

5.6 Robustness Tests

I provide two sets of robustness tests. First, I follow Xu (2017) in conducting a robustness test using nonlinear transformation on the tests that use dummy variables as outcomes. Many of the outcome variables of the study are binary, and it is natural to use a nonlinear transformation such that the estimated probability belongs to the unit interval. Concern may arise about the local linear estimators in the main results being biased or at least suboptimal. According to Xu (2017), it is true that the local linear estimator becomes suboptimal but he argues that the traditional estimators are still within the optimal rate.

The binary identifiers used in the study are mortality, ER visits, and work stoppage. Table A1 presents the results following Xu (2017). The results of Table A1 are not qualitatively different from the main results. The estimated results on mortality, ER visits, and work stoppage are -0.11% (compared with -0.10%), -0.70% (compared with -1.25%), and 0.59% (compared with 0.91%), respectively. Thus, the mortality rate demonstrates very high consistency, whereas ER visits and work stoppages show some

differences. The study still uses the linear estimator as the main specification because age groups and disease categories cannot be controlled for following Xu (2017).

Then, I provide the robustness tests on the main results using slightly broader and narrower bandwidths in Table A2 and Table A3, respectively, than the baseline bandwidths. The results are qualitatively similar to the main results.

6 Conclusion

Does access to finance improve individuals' medical decisions even with universal health care? A poor household without credit access often delays or ceases necessary medical treatment even when it is inexpensive. The main concern of poor households is that receiving proper medical treatment takes not only their money but also their time, which means an immediate reduction in consumption due to the loss of future labor income. This study focuses on the trade-offs that individuals face between their health and the loss of income from seeking medical treatment.

I exploit the unique institutional settings of Korea, where the National Health Insurance Service, the mandatory universal health care system, provides high coverage of medical costs, such that the out-of-pocket medical costs are likely to be the primary factor driving medical decisions, and where the Sunshine Loan, a government-subsidized preferential loan scheme, provides a random variation of credit access around the eligibility threshold. Using a regression discontinuity design around the eligibility threshold, I find that individuals with access to subsidized credit have better health outcomes than those without such access.

The households whose income is marginally lower than the threshold (and who are therefore eligible for the subsidized loans) tend to exhibit a lower mortality rate than those whose income is marginally higher than the threshold (and are therefore ineligible for the subsidized loans). Furthermore, I find that those from eligible households tend to have a lower probability of emergency room (ER) visits, a lower likelihood of disease being diagnosed in an ER visit, a shorter delay between diagnosis and treatment, and a higher likelihood of regular visits to treat chronic diseases compared with those from

households above the threshold. These results suggest that providing credit access can encourage low-income households to obtain early diagnoses and timely treatment.

I also find that the eligible households tend to experience more work stoppages due to diseases and stay longer in hospital than ineligible households. However, because I do not observe a significant increase in out-of-pocket medical expenses, the impact of access to finance operates via the opportunity cost channel rather than the direct cost channel. These results show that individuals with access to credit are significantly more likely to stop work when they are unwell and seek treatment timely compared with ineligible individuals.

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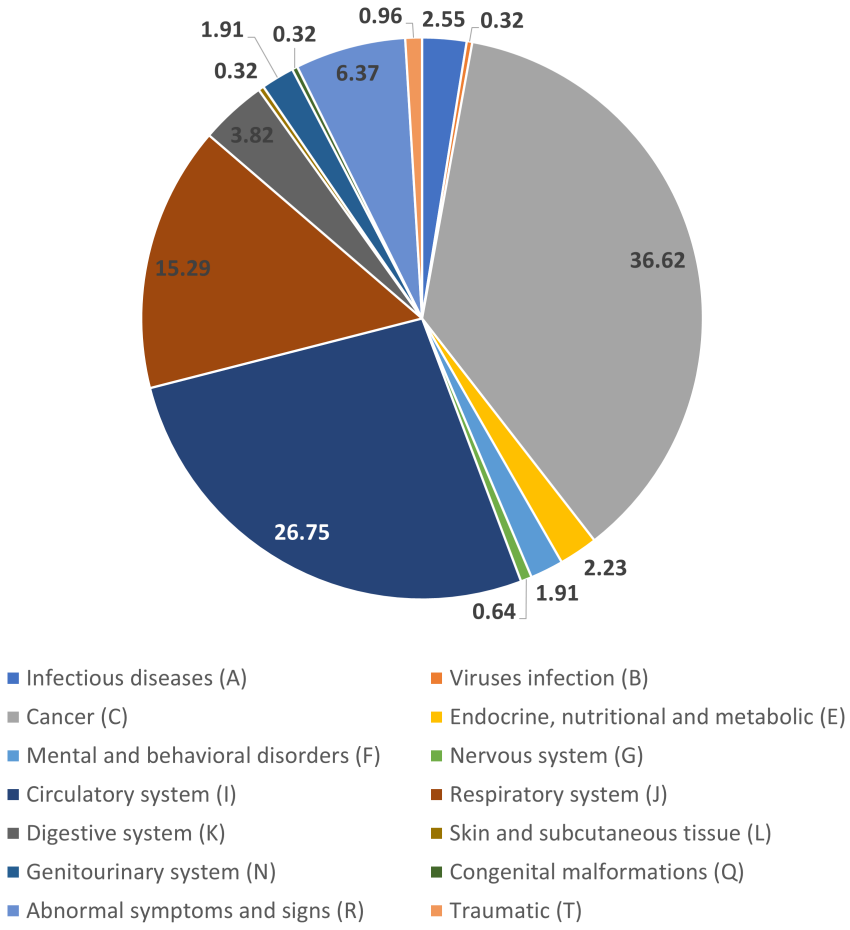
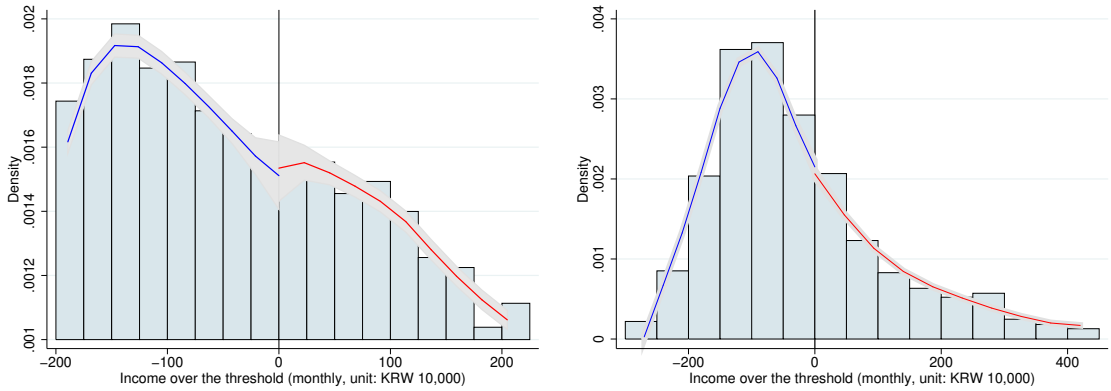
Figure 1 Deaths caused by diseases



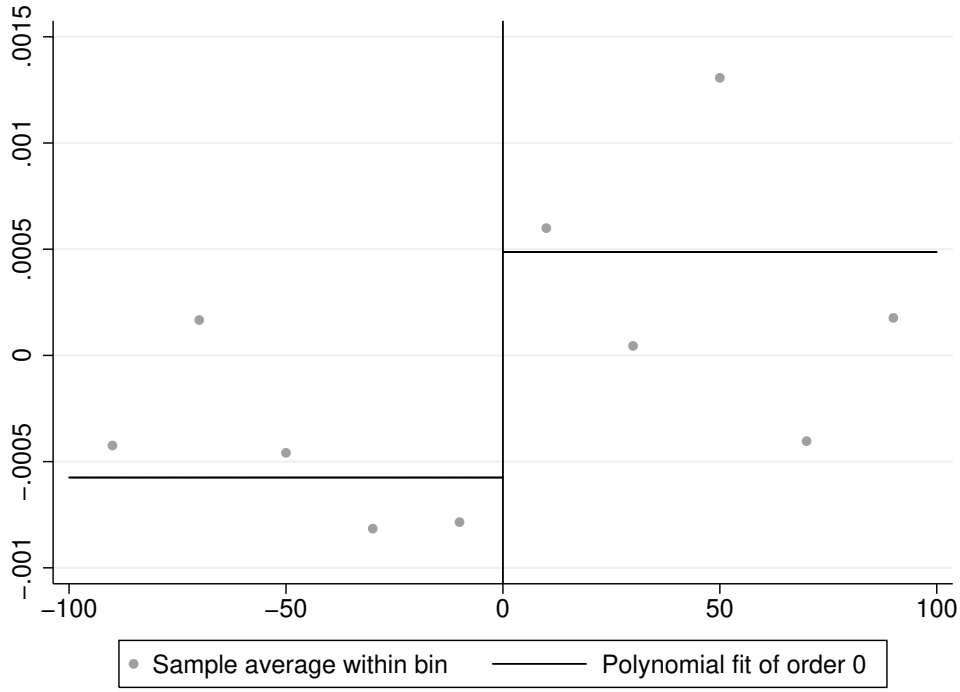
Note: This figure presents the pie chart for the deaths caused by each disease category. The numbers presented next to each portion of pie show the percentage of deaths caused by the disease category. The categories follow the Korean Classification of Diseases (KCD), with the codes shown in the parentheses in the legend.

Figure 2 Manipulation tests



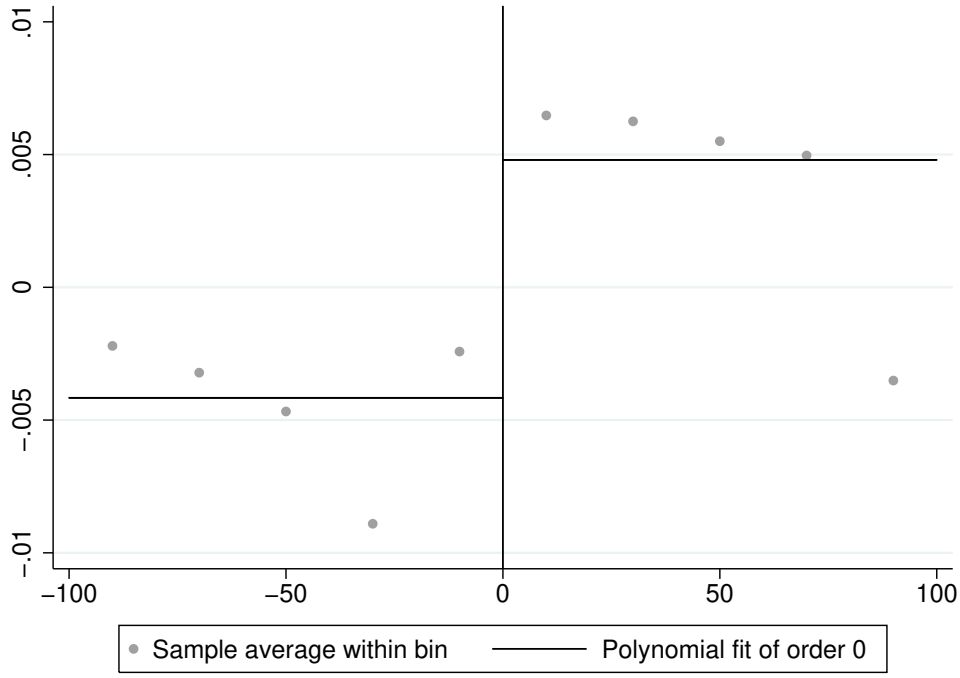
Note: These figures present the manipulation test using the local polynomial density estimators proposed in Cattaneo et al. (2020). The left and right figures plot the tests using the NaSTaB and KHPS samples. The sample distribution of monthly income over the threshold (unit: KRW10,000) is presented in a histogram (bluish-gray bars), and the estimated density plots are shown in blue (treatment) and red (control) lines. The gray area presents the 95% confidence interval. The estimated test statistics are 0.2893 (p—value of 0.772) and 1.385 (p—value of 0.166).

Figure 3 Discontinuity on deaths caused by diseases



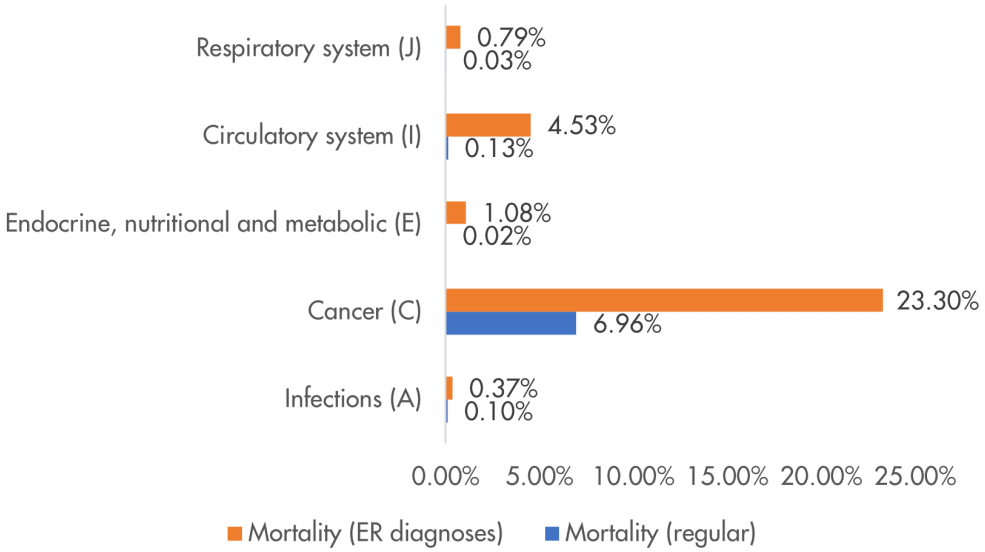
Note: This figure depicts the scatter plots (averaged within bins) with the local constant lines on the deaths caused by diseases. The x-axis measures the income over the threshold, while the y-axis measures the residualized outcome variables after controlling for the age group and disease categories.

Figure 4 Discontinuity on emergency room visits caused by diseases



Note: This figure presents the pie chart for the deaths caused by each disease category. The numbers presented next to each portion of pie show the percentage of deaths caused by the disease category. The categories follow the Korean Classification of Diseases (KCD), with the codes shown in the parentheses in the legend.

Figure 5 Mortality rates conditioned on ER diagnoses



Note: This figure presents the mortality rates conditioned on late diagnoses upon an emergency room visit. The mortality rate of each disease category is shown in a bar chart. The orange bar presents the average mortality rates of the patients whose diseases are diagnosed upon emergency room visits, and the blue bar depicts the average mortality rates of the patients whose diseases are diagnosed in regular walk-ins.

Table 1 Summary statistics

This table presents the summary statistics of the sample used in the study. The main data sets used are the Korea Health Panel Survey (KHPS) and the National Survey of Tax and Benefits (NaSTaB) for the sample period of 2010–2018. The NaSTaB sample consists of 25,185 household years with identifiable labor incomes and 4,395 individual households. The KHPS sample consists of 39,566 individual years with identifiable labor incomes, and 12,055 unique individuals. All non-dummy variables are winsorized at the 99% level to mitigate the effect of outliers. Regular employees are removed from the sample. Detailed information on data and variable construction is provided in Section 4.

Panel A. KHPS individual data

	Obs	Mean	SD	P25	Median	P75
Monthly income	39,566	1720	1417	833.3	1400	2080
Income over the threshold	39,566	-639.0	127.7	-1367	-765.0	2333
Death caused by diseases (%)	39,566	0.071	0.027	0.000	0.000	0.000
Emergencies caused by diseases (%)	39,566	4.910	21.61	0.000	0.000	0.000
Out-of-pocket medical costs	39,566	370.4	782.8	8.3	68.1	313.7
Work stoppage (%)	39,566	2.356	15.17	0.000	0.000	0.000

Panel B. NaSTaB household data

	Obs	Mean	SD	P25	Median	P75
Average monthly income	25,185	2680	1959	1300	2111	3504
Minimum monthly income	25,185	2371	1977	1000	1747	3125
Income over the threshold	25,185	-10.65	2015	-1400	-639	833
Debt	25,185	6827	25020	0.000	0.000	0.000
Debt taking dummy	25,185	0.158	0.365	0.000	0.000	0.000
Medical expense	25,185	1348	2021	160	580	1600
Inpatient care dummy	25,185	0.155	0.362	0.000	0.000	0.000

Table 2 Treatment effect on debt

This table presents the estimated treatment effect of access to subsidized loans on household debt. The outcome variables are the debt existence dummy, debt increase dummy, outstanding debt amount (natural logarithm), and debt increases. The running variable is income over the threshold. It follows Calonico et al. (2017) with a local constant (zero polynomial) using the optimal bandwidth selected following Calonico et al. (2020). I also report the conditional mean of the outcome variables. p—values are reported in parentheses.

	(1) Debt existence dummy	(2) Debt increase dummy	(3) Debt amount (log)	(4) Debt increased (%)
LATE (%)	2.66*	2.88**	18.16*	25.20**
	(0.06)	(0.03)	(0.08)	(0.05)
Observations	25,185	25,185	25,185	25,185
Cond. avg. of Y	16.65%	9.80%	1.275	-5.99%
Cond. avg. of raw Y (KRW, million)			7.292	

Table 3 Medical decisions around debt increases

This table presents the statistics of medical decisions conditioned on households' debt increase. I show the averages of the medical care dummy, the inpatient care dummy, and increases in the medical expenses conditioned on debt increases. I also report the differences in the average outcome variables of the households with increased debt and those of the other households, and p—values are reported in parentheses.

	(1) Medical care	(2) Inpatient care	(3) Medical Exp	Observations
Debt increased	95.77%	20.00%	90.66	3,755
Baseline	93.22%	15.17%	11.62	34,537
Diff	2.54%***	4.83%***	79.04*	
p—value	(0.00)	(0.00)	(0.05)	

Table 4 Access to finance and deaths caused by diseases

This table presents the estimated treatment effect of access to subsidized loans on the mortality rate. The outcome variable is the death caused by diseases dummy, and the running variable is the income over the threshold. It follows Calonico et al. (2017) with a local constant (zero polynomial) using the optimal bandwidth selected following Calonico et al. (2020). I show the results controlling for the age groups and disease categories. Each column presents the results for different samples: low-income households, regular workers, non-working household members, and low-income households with a false threshold (100 left to the actual threshold). I also report the conditional mean of the outcome variables. p—values are reported in parentheses.

	(1) Deaths excl. accidents	(2) Deaths excl. accidents	(3) Deaths and disabilities	(4) Deaths and disabilities
LATE (%)	-0.10*	-0.11**	-0.11**	-0.12**
	(0.05)	(0.04)	(0.04)	(0.03)
Observations	64,313	64,313	64,313	64,313
Age group	No	Yes	No	Yes
Disease type	No	Yes	No	Yes
Avg. of Y (%)	0.16	0.16	0.24	0.24

Table 5 Access to finance and deaths caused by diseases

This table presents the estimated treatment effect of access to subsidized loans on the mortality rate. The outcome variable is the death caused by diseases dummy, and the running variable is the income over the threshold. It follows Calonico et al. (2017) with a local constant (zero polynomial) using the optimal bandwidth selected following Calonico et al. (2020). I show the results controlling for the age groups and disease categories. Each column presents the results for different samples: low-income households, regular workers, non-working household members, and low-income households with a false threshold (100 left to the actual threshold). I also report the conditional mean of the outcome variables. p—values are reported in parentheses.

	(1)	(2)	(3)	(4)
	Deaths caused by diseases			
	Non-regular workers	Regular workers	Non-working family members	False threshold [−100]
LATE (%)	-0.10**	-0.03	-0.02	-0.01
	(0.03)	(0.26)	(0.77)	(0.76)
Observations	39,566	36,076	76,881	59,640
Age group	Yes	Yes	Yes	Yes
Disease type	Yes	Yes	Yes	Yes
Avg. of Y (%)	0.14	0.08	0.13	0.09

Table 6 Access to finance and medical decisions

This table presents the estimated treatment effect of access to subsidized loans on different medical variables. The outcome variables are an emergency room (ER) visit dummy, a dummy for diseases being diagnosed by an ER visit, a delay of the first treatment (in days), a regular visit dummy for patients with chronic diseases, and counts of visits for patients with chronic diseases. The running variable is the income over the threshold. It follows Calonico et al. (2017) with a local constant (zero polynomial) and uniform kernel using the optimal bandwidth selected following Calonico et al. (2020). I also report each model's bandwidth and the outcome variables' conditional mean. p—values are reported in parentheses.

	(1) ER visit	(2) ER diagnosis	(3) Delay	(4) Regular visit	(5) Visits
LATE	-1.25***	-1.01**	-62.58**	2.28**	0.24***
	(0.01)	(0.01)	(0.04)	(0.03)	(0.00)
Observations	39,566	39,566	2,477	25,796	32,515
Age group	Yes	Yes	Yes	Yes	Yes
Disease type	Yes	Yes	Yes	Yes	Yes
Cond. avg. of Y	5.46%	3.99%	146.38	63.13%	2.99

Table 7 Testing myopia and information channels

This table presents the impact of access to credit for two sub-samples of individuals: sub-sample by age and sub-sample by chronic diseases (CD). The outcome variables are work stoppage dummy and death caused by diseas dummy. The running variable is the income over the threshold. It follows Calonico et al. (2017) with a local constant (zero polynomial) and uniform kernel using the optimal bandwidth selected following Calonico et al. (2020). I also report each model's bandwidth. p—values are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Work stoppage		Mortality rate		Work stoppage		Mortality rate	
	Age>45	Age<=45	Age>45	Age<=45	CD	noCD	CD	noCD
LATE	0.80	2.10**	-0.08	-0.05	2.56**	0.17	-0.11*	0.02
	(0.26)	(0.01)	(0.26)	(0.27)	(0.00)	(0.87)	(0.09)	(0.53)
Observations	29,441	10,125	30,332	9,234	32,515	7,051	32,515	7,051
Age group	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Disease type	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cond. avg. of Y	2.23	2.07	0.13	0.06	1.97	2.35	0.15	0.04

Table 8 Access to finance and opportunity cost channel

This table presents the estimated treatment effect of access to subsidized loans on different medical variables to test the opportunity cost channel. The outcome variables are work stoppage dummy, inpatient care dummy, inpatient days (days in hospital), ans natural log of out-of-pocket medical costs. The running variable is the income over the threshold. It follows Calonico et al. (2017) with a local constant (zero polynomial) and uniform kernel using the optimal bandwidth selected following Calonico et al. (2020). I also report each model's bandwidth and the outcome variables' conditional mean. p—values are reported in parentheses.

	(1) Work stoppage	(2) Inpatient	(3) Inpatient days	(4) OoP cost
LATE	0.91**	1.39*	1.70**	0.11
	(0.04)	(0.09)	(0.01)	(0.44)
Observations	39,566	39,566	5,032	39,566
Age group	Yes	Yes	Yes	Yes
Disease type	Yes	Yes	Yes	Yes
Cond. avg. of Y	2.08%	11.04%	1.10	7.57
Cond. avg. of raw Y (KRW, thousand)				246.89

Table 9 Heterogeneity on characteristics

This table presents the heterogenous impact of credit access on work stoppage. The estimation parameters are the same as in Table 8. *p*—values are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)
	Work stoppage					
	female	male	single	with children	high-skill	low-skill
LATE	0.01	-1.76**	-0.68	-1.56***	-1.10	-1.86***
	(0.99)	(0.01)	(0.54)	(0.01)	(0.25)	(0.01)
Observations	19,624	19,942	11,172	21,235	6,225	29,567
Age group	Yes	Yes	Yes	Yes	Yes	Yes
Disease type	Yes	Yes	Yes	Yes	Yes	Yes

Table A1 Robustness: Dummy variables

This table presents the estimated treatment effect of access to subsidized loans on the mortality rate, the emergency room (ER) visit dummy, and the work stoppage dummy. The running variable is income over the threshold. It follows Xu (2017) and his suggested parameters to estimate the optimal bandwidth and the average treatment effects. I also report the bandwidth used in each model and the conditional mean of the outcome variables. p—values are reported in parentheses.

	(1) Death	(2) ER visit	(3) Work stoppage
LATE	-0.11**	-0.70*	0.59*
	(0.02)	(0.08)	(0.06)
Observations	39,566	39,566	39,566
Age group	No	No	No
Disease type	No	No	No
Cond. avg. of Y (%)	0.12	5.38	2.01

Table A2 Robustness: Treatment effect on debt (different bandwidth)

This table presents the robustness tests for Table 2. The estimation parameters are the same as in Table 2 and provide a set of robustness checks using different bandwidths (±10%). p—values are reported in parentheses.

Panel A. Debt existence dummy

	(1)	(2)	(3)
LATE (%)	2.66*	3.00**	2.17*
	(0.06)	(0.04)	(0.10)
Observations	25,185	25,185	25,185
Age-group	Yes	Yes	Yes
Diseases type	Yes	Yes	Yes
Bandwidth	Optimal	[-10%]	[+10%]

Panel B. Debt increase dummy

	(1)	(2)	(3)
LATE (%)	2.88**	2.63**	3.25**
	(0.03)	(0.05)	(0.01)
Observations	25,185	25,185	25,185
Age-group	Yes	Yes	Yes
Diseases type	Yes	Yes	Yes
Bandwidth	Optimal	[-10%]	[+10%]

Panel C. Debt amount (log)

	(1)	(2)	(3)
LATE (%)	18.16*	26.78**	24.63**
	(0.08)	(0.02)	(0.01)
Observations	25,185	25,185	25,185
Age-group	Yes	Yes	Yes
Diseases type	Yes	Yes	Yes
Bandwidth	Optimal	[-10%]	[+10%]

Panel D. Debt increased (%)

	(1)	(2)	(3)
LATE (%)	25.20**	16.72	23.03*
	(0.05)	(0.12)	(0.07)
Observations	25,185	25,185	25,185
Age group	Yes	Yes	Yes
Disease type	Yes	Yes	Yes
Bandwidth	Optimal	[-10%]	[+10%]

Table A3 Robustness: Access to finance and deaths caused by diseases (different bandwidth)

This table presents the robustness tests for Table 4. The estimation parameters are the same as in Table 4, and it provides a set of robustness checks using different bandwidths (±10%). *p*—values are reported in parentheses. Panel A. Low-income households

	(1)	(2)	(3)
LATE (%)	-0.10**	-0.10**	-0.10**
	(0.02)	(0.03)	(0.02)
Observations	39,566	39,566	39,566
Age group	Yes	Yes	Yes
Disease type	Yes	Yes	Yes
Bandwidth	Optimal	[-10%]	[+10%]
Panel B. Regular workers			
	(1)	(2)	(3)
LATE (%)	-0.03	-0.03	-0.03
	(0.26)	(0.27)	(0.26)
Observations	36,076	36,076	36,076
Age group	Yes	Yes	Yes
Disease type	Yes	Yes	Yes
Bandwidth	Optimal	[-10%]	[+10%]
Panel C. Non-working families			
	(1)	(2)	(3)
LATE (%)	0.02	0.02	0.02
	(0.77)	(0.76)	(0.72)
Observations	76,881	76,881	76,881
Age group	Yes	Yes	Yes
Disease type	Yes	Yes	Yes
Bandwidth	Optimal	[-10%]	[+10%]
Panel D. False threshold [-100]			
	(1)	(2)	(3)
LATE (%)	-0.01	-0.01	-0.01
	(0.76)	(0.78)	(0.76)
Observations	59,640	59,640	59,640
Age group	Yes	Yes	Yes
Disease type	Yes	Yes	Yes
Bandwidth	Optimal	[-10%]	[+10%]