Roads and Loans

Sumit Agarwal, Abhiroop Mukherjee and S. Lakshmi Naaraayanan

May 22, 2018

Roadmap

Motivation: Finance and Productivity Changes

- When productive opportunities improve, financing should flow to those who see gains

Motivation: Finance and Productivity Changes

- When productive opportunities improve, financing should flow to those who see gains

- But does private financing really respond to productivity changes – even in the day-to-day lives of the world's poor?
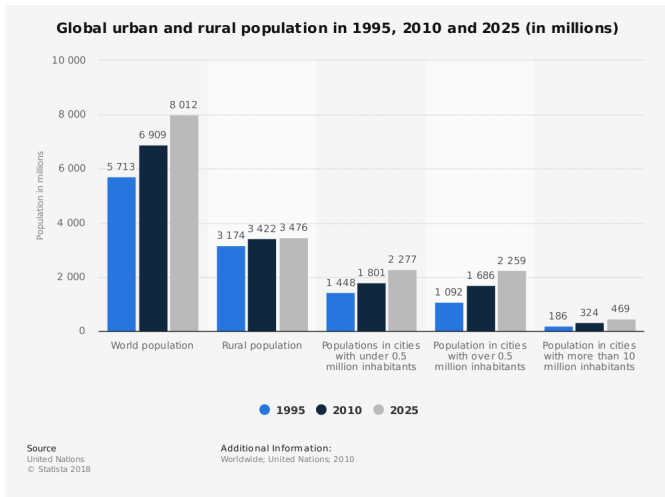
Motivation: Finance and Productivity Changes

- When productive opportunities improve, financing should flow to those who see gains

- But does private financing really respond to productivity changes – even in the day-to-day lives of the world's poor?
  - private banks typically do not lend in rural areas

Motivation: Finance and Productivity Changes

- When productive opportunities improve, financing should flow to those who see gains

- But does private financing really respond to productivity changes – even in the day-to-day lives of the world's poor?
  - private banks typically do not lend in rural areas
  - for the handful that do, they have little experience in rural banking and face a steep learning curve
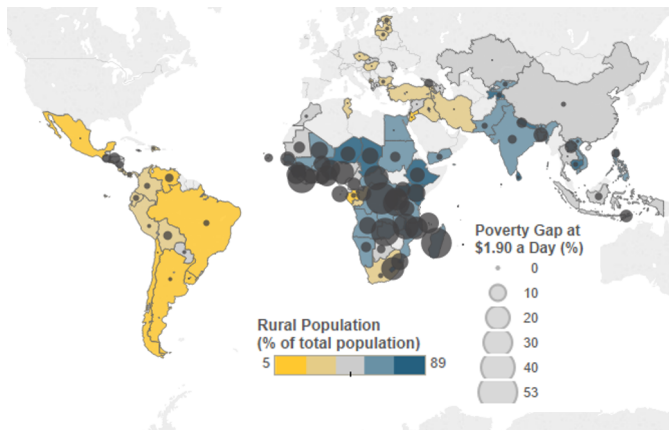
- 3.5 billion people live in rural areas

Global urban and rural population in 1995, 2010 and 2025 (in millions)

Motivation: Finance and Productivity Changes

- Most 'Emerging Markets' are still poor and largely rural

Motivation: Finance and Productivity Changes

- We shed new light on this issue by focusing on a large rural road-building initiative in India

- We shed new light on this issue by focusing on a large rural road-building initiative in India

- Do private lenders respond to new lending opportunities created by connectivity?

- In many parts of the world, infrastructure projects are thought to be key to unlocking productivity increases

New Roads Everywhere

- In many parts of the world, infrastructure projects are thought to be key to unlocking productivity increases
  - e.g., Storeygard(2014), Aggarwal (2018), Donaldson(2016), Shamdasani (2017), Asher and Novosad (2018), Lin (2018)

New Roads Everywhere

- In many parts of the world, infrastructure projects are thought to be key to unlocking productivity increases
  - e.g., Storeygard(2014), Aggarwal (2018), Donaldson(2016), Shamdasani (2017), Asher and Novosad (2018), Lin (2018)
- Roads are particularly topical

New Roads Everywhere

- In many parts of the world, infrastructure projects are thought to be key to unlocking productivity increases
  - e.g., Storeygard(2014), Aggarwal (2018), Donaldson(2016), Shamdasani (2017), Asher and Novosad (2018), Lin (2018)

- Roads are particularly topical
  - Tremendous growth in roads in Asia, Africa, South America, and Eastern Europe in the past 20 years alone

New Roads Everywhere

- In many parts of the world, infrastructure projects are thought to be key to unlocking productivity increases
  - e.g., Storeygard(2014), Aggarwal (2018), Donaldson(2016), Shamdasani (2017), Asher and Novosad (2018), Lin (2018)

- Roads are particularly topical
  - Tremendous growth in roads in Asia, Africa, South America, and Eastern Europe in the past 20 years alone
  - China's trillion dollar 'Belt and Road Initiative' – "the biggest investment project in history"

New Roads Everywhere

- In many parts of the world, infrastructure projects are thought to be key to unlocking productivity increases
  - e.g., Storeygard(2014), Aggarwal (2018), Donaldson(2016), Shamdasani (2017), Asher and Novosad (2018), Lin (2018)

- Roads are particularly topical
  - Tremendous growth in roads in Asia, Africa, South America, and Eastern Europe in the past 20 years alone
  - China's trillion dollar 'Belt and Road Initiative' – "the biggest investment project in history"
  - India built 1.96 million kilometers of rural roads between 2000-2016 connecting 100s of millions

Roads to Growth?

- How are roads meant to create productive opportunities for people connected?

Roads to Growth?

- How are roads meant to create productive opportunities for people connected?

  - changing crop patterns from subsistence cereal farming to more profitable market-based crops

Roads to Growth?

- How are roads meant to create productive opportunities for people connected?

  - changing crop patterns from subsistence cereal farming to more profitable market-based crops

  - allowing surplus agricultural laborers to commute to nearby towns to access more productive jobs

Roads to Growth?

- How are roads meant to create productive opportunities for people connected?

  - changing crop patterns from subsistence cereal farming to more profitable market-based crops

  - allowing surplus agricultural laborers to commute to nearby towns to access more productive jobs
  - opening or expansion of small businesses, like village grocery shops

- Many of these channels, however, require availability of financing

Roads to Growth?

- Many of these channels, however, require availability of financing
  - Typically assumed that such financing to households will automatically follow once roads are built

Roads to Growth?

- Many of these channels, however, require availability of financing
  - Typically assumed that such financing to households will automatically follow once roads are built
  - But many rural economies suffer from chronic problems of financing

Roads to Growth?

- Many of these channels, however, require availability of financing
    - Typically assumed that such financing to households will automatically follow once roads are built
    - But many rural economies suffer from chronic problems of financing
        - Formal finance is largely absent in many parts of the world

Roads to Growth?

- Many of these channels, however, require availability of financing
  - Typically assumed that such financing to households will automatically follow once roads are built
  - But many rural economies suffer from chronic problems of financing
    - Formal finance is largely absent in many parts of the world
    - Informal money lenders charge usurious interest rates, tying down laborers to dismal conditions

- Central question today in finance for emerging markets

Roads and Finance

- Central question today in finance for emerging markets
  - Will private sector financing respond to changing productive opportunities created by these mega infrastructure projects?

Roads and Finance

- Central question today in finance for emerging markets
  - Will private sector financing respond to changing productive opportunities created by these mega infrastructure projects?
    - Outside of very limited microfinance wings, private banks typically do not lend to rural households, ticket sizes are small

Roads and Finance

- Central question today in finance for emerging markets
  - Will private sector financing respond to changing productive opportunities created by these mega infrastructure projects?
    - Outside of very limited microfinance wings, private banks typically do not lend to rural households, ticket sizes are small
    - But massive market sizes and growth rates of the rural sector in emerging economies has piqued interest recently

Roads and Finance

- Central question today in finance for emerging markets
  - Will private sector financing respond to changing productive opportunities created by these mega infrastructure projects?
    - Outside of very limited microfinance wings, private banks typically do not lend to rural households, ticket sizes are small
    - But massive market sizes and growth rates of the rural sector in emerging economies has piqued interest recently
    - Can these new rural wings of banks recognize new lending opportunities arising out of infrastructure programs and utilize these to establish/expand footprints?

Roads and Finance

- Why do we care?

Roads and Finance

- Why do we care?
  - If private financing does NOT respond:

Roads and Finance

- Why do we care?
  - If private financing does NOT respond:
    - governments will have to provide financing to rural households on top of financing roads

Roads and Finance

- Why do we care?
  - If private financing does NOT respond:
    - governments will have to provide financing to rural households on top of financing roads
  - If private financing DOES respond:

Roads and Finance

- Why do we care?
    - If private financing does NOT respond:
        - governments will have to provide financing to rural households on top of financing roads
    - If private financing DOES respond:
        - room for private sector financing can mean less fiscal pressure, easier path to benefits percolating down

Roads and Finance

- Why do we care?
  - If private financing does NOT respond:
    - governments will have to provide financing to rural households on top of financing roads
  - If private financing DOES respond:
    - room for private sector financing can mean less fiscal pressure, easier path to benefits percolating down

- Relates to literature on the role of financing in development

Roads and Finance

- Why do we care?
  - If private financing does NOT respond:
    - governments will have to provide financing to rural households on top of financing roads
  - If private financing DOES respond:
    - room for private sector financing can mean less fiscal pressure, easier path to benefits percolating down

- Relates to literature on the role of financing in development
  - King and Levine (1993), Black and Strahan (2002), Burgess and Pande (2004), Levine (2005), Beck, Demirguc-Kunt and Peria (2007), Demirguc-Kunt and Levine (2008), Beck (2012), Demirguc-Kunt, Feyen, and Levine (2013)

- Distributional Effects

Roads and Finance

- Distributional Effects
  - If financing does respond, who does it benefit more?

- Distributional Effects
    - If financing does respond, who does it benefit more?
        - Richer villagers who had access to finance before roads, and might be in a better position to exploit new opportunities?

Roads and Finance

- Distributional Effects
  - If financing does respond, who does it benefit more?
    - Richer villagers who had access to finance before roads, and might be in a better position to exploit new opportunities?
    - Or the poor – people who were excluded from formal finance, but can now find a way in?

Roads and Finance

- Distributional Effects
    - If financing does respond, who does it benefit more?
        - Richer villagers who had access to finance before roads, and might be in a better position to exploit new opportunities?
        - Or the poor – people who were excluded from formal finance, but can now find a way in?
    - Will roads increase – or reduce – inequality in financial access?

Main Challenge

- Difficult to accurately identify the impact of new infrastructure

Main Challenge

- Difficult to accurately identify the impact of new infrastructure
  - Hard to identify an appropriate counterfactual or comparison group

- Difficult to accurately identify the impact of new infrastructure
  - Hard to identify an appropriate counterfactual or comparison group
  - What would have happened if roads were not built where they got built?

Main Challenge

- Difficult to accurately identify the impact of new infrastructure
    - Hard to identify an appropriate counterfactual or comparison group
    - What would have happened if roads were not built where they got built?
        - We can observe what happens before and after new infrastructure is constructed in 'treated' areas

Main Challenge

- Difficult to accurately identify the impact of new infrastructure

  - Hard to identify an appropriate counterfactual or comparison group

  - What would have happened if roads were not built where they got built?

    - We can observe what happens before and after new infrastructure is constructed in 'treated' areas

    - But incorrect to attribute the change exclusively to roads – maybe policy is to help a region: roads and financing are both a result of that

Main Challenge

- Difficult to accurately identify the impact of new infrastructure

  - Hard to identify an appropriate counterfactual or comparison group

  - What would have happened if roads were not built where they got built?

    - We can observe what happens before and after new infrastructure is constructed in 'treated' areas

    - But incorrect to attribute the change exclusively to roads – maybe policy is to help a region: roads and financing are both a result of that

    - Could be solved if we could find 2 identical villages, one that – randomly – gets a road, the other does not

- Exploit conditions surrounding India's *Pradhan Mantri Gram Sadak Yojna* (PMGSY)

How we progress

- Exploit conditions surrounding India's *Pradhan Mantri Gram Sadak Yojna* (PMGSY)
  - Objective was to provide all-weather road connectivity to hitherto unconnected villages

How we progress

- Exploit conditions surrounding India's *Pradhan Mantri Gram Sadak Yojna* (PMGSY)
  - Objective was to provide all-weather road connectivity to hitherto unconnected villages
  - Aggarwal (2018) and Shamdasani (2017)

How we progress

- Exploit conditions surrounding India's *Pradhan Mantri Gram Sadak Yojna* (PMGSY)
  - Objective was to provide all-weather road connectivity to hitherto unconnected villages
  - Aggarwal (2018) and Shamdasani (2017)

- Program explicitly prioritized building new roads to connect all villages above explicit population thresholds

How we progress

- Exploit conditions surrounding India's *Pradhan Mantri Gram Sadak Yojna* (PMGSY)
  - Objective was to provide all-weather road connectivity to hitherto unconnected villages
  - Aggarwal (2018) and Shamdasani (2017)

- Program explicitly prioritized building new roads to connect all villages above explicit population thresholds
  - E.g., villages with populations just above key round figures, 1000 and 500, were to be prioritized under the program.

How we progress

- Exploit conditions surrounding India's *Pradhan Mantri Gram Sadak Yojna* (PMGSY)
  - Objective was to provide all-weather road connectivity to hitherto unconnected villages
  - Aggarwal (2018) and Shamdasani (2017)

- Program explicitly prioritized building new roads to connect all villages above explicit population thresholds
  - E.g., villages with populations just above key round figures, 1000 and 500, were to be prioritized under the program.
  - Assuming a village with population just below the threshold, say population 480, is very similar to one just above, say population 520 – if one has a road and the other does not, this is almost random

How we progress

- Exploit conditions surrounding India's *Pradhan Mantri Gram Sadak Yojna* (PMGSY)
  - Objective was to provide all-weather road connectivity to hitherto unconnected villages
  - Aggarwal (2018) and Shamdasani (2017)

- Program explicitly prioritized building new roads to connect all villages above explicit population thresholds
  - E.g., villages with populations just above key round figures, 1000 and 500, were to be prioritized under the program.
  - Assuming a village with population just below the threshold, say population 480, is very similar to one just above, say population 520 – if one has a road and the other does not, this is almost random

- Allows us to identify the effect of roads better

Population-based Cutoffs for Road Building

Census villages
Ganjam district, Odisha

■ Below Cutoff
■ Above Cutoff
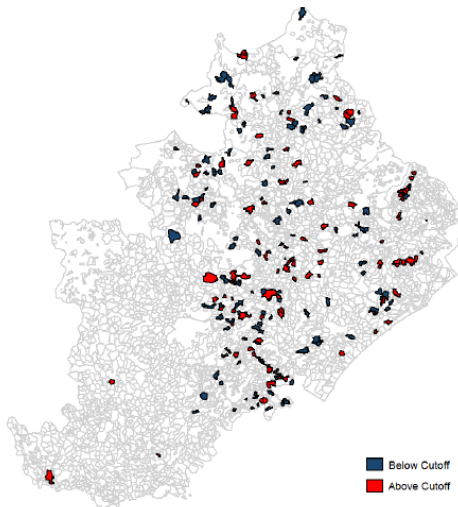
Summary Results

- We find large financing responses to rural road connectivity

Summary Results

- We find large financing responses to rural road connectivity
  - In villages right above the population cutoff

Summary Results

- We find large financing responses to rural road connectivity
  - In villages right above the population cutoff
    - over 50% more villagers receive loans

Summary Results

- We find large financing responses to rural road connectivity
  - In villages right above the population cutoff
    - over 50% more villagers receive loans
    - average amount lent to them is 20-40% higher

Summary Results

- We find large financing responses to rural road connectivity
  - In villages right above the population cutoff
    - over 50% more villagers receive loans
    - average amount lent to them is 20-40% higher
  - Roads seem to disproportionately benefit

Summary Results

- We find large financing responses to rural road connectivity
  - In villages right above the population cutoff
    - over 50% more villagers receive loans
    - average amount lent to them is 20-40% higher
  - Roads seem to disproportionately benefit
    - villagers who lack collateralizable assets

Summary Results

- We find large financing responses to rural road connectivity
  - In villages right above the population cutoff
    - over 50% more villagers receive loans
    - average amount lent to them is 20-40% higher
  - Roads seem to disproportionately benefit
    - villagers who lack collateralizable assets
    - lower caste villagers with basic education

Roadmap

Does being above the population cutoff really predict road construction?
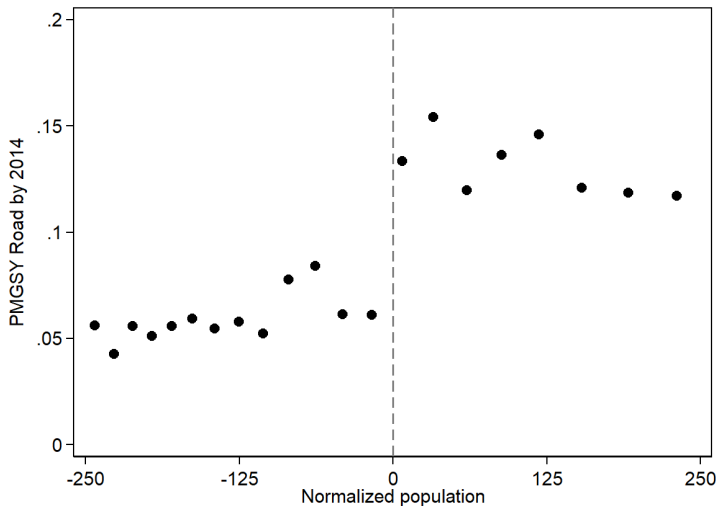
Does being above the population cutoff really predict road construction?

	Census sample		Bank Loan sample	
	(1)	(2)	(3)	(4)
Bandwidth	± 200	± 250	± 200	± 250
Above Cutoff	0.073***	0.069***	0.552***	0.454***
	(0.011)	(0.010)	(0.017)	(0.010)
F-statistic	41.8	47.8	1106.8	1894.9
District-Threshold FE	Yes	Yes	No	No
Threshold FE	No	No	Yes	Yes
R^2	0.07	0.06	0.20	0.22
Observations	10616	13527	8141	9260

- An average *Odisha* village right above the population cutoff is more than twice as likely (6.2% vis-a-vis 13.3%) to get a road than one right below
  - Similar differences in our bank loan sample

No evidence of population manipulation
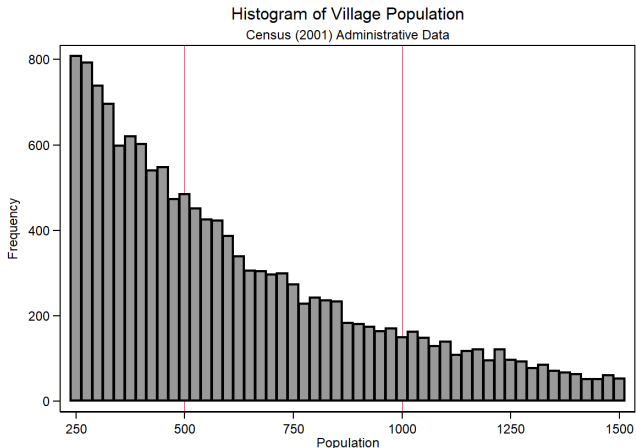
Population figures from 2001 census – before PMGSY policy cutoffs announced

No differences in other village characteristics around cutoff
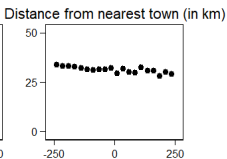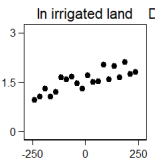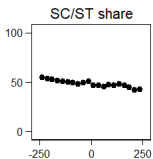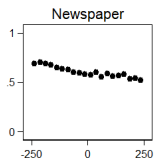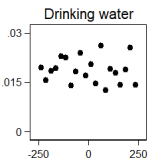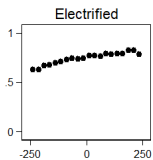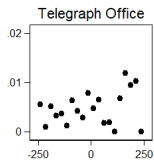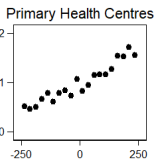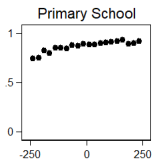
- Proprietary loan-level dataset from one of India's earliest private
  lenders to enter the rural sector

- Proprietary loan-level dataset from one of India's earliest private lenders to enter the rural sector
    - Loans made to villagers in the largely rural district of *Ganjam* in the eastern state of *Odisha*

- Proprietary loan-level dataset from one of India's earliest private lenders to enter the rural sector
  - Loans made to villagers in the largely rural district of *Ganjam* in the eastern state of *Odisha*
  - Detailed information on loans made, purpose of loan, maturity, repayment behavior, and borrower characteristics

Financing: Data

- Proprietary loan-level dataset from one of India's earliest private lenders to enter the rural sector

  - Loans made to villagers in the largely rural district of *Ganjam* in the eastern state of *Odisha*
  - Detailed information on loans made, purpose of loan, maturity, repayment behavior, and borrower characteristics

- Supplemented by data from PMGSY and Census websites, carefully hand-matched

Bank presence in *Ganjam*

Bank lending sample
Ganjam district, Odisha

Other villages
Sample
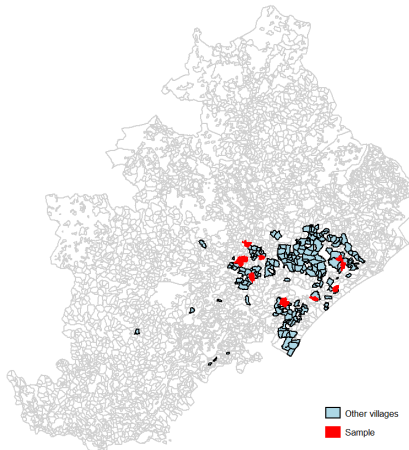
Sample villages within population range ($+/-$200) in very close proximity

- Compare various financing-related outcomes for villagers in above cutoff villages, relative to below

Empirical Methodology

- Compare various financing-related outcomes for villagers in above cutoff villages, relative to below
  - All villages were unconnected when the bank started operations in our district

Empirical Methodology

- Compare various financing-related outcomes for villagers in above cutoff villages, relative to below
  - All villages were unconnected when the bank started operations in our district
  - Most of the above-cutoff ones received roads before the end of our sample; many below-cutoff ones did not

Empirical Methodology

- Compare various financing-related outcomes for villagers in above cutoff villages, relative to below
  - All villages were unconnected when the bank started operations in our district
  - Most of the above-cutoff ones received roads before the end of our sample; many below-cutoff ones did not
- Key idea:

Empirical Methodology

- Compare various financing-related outcomes for villagers in above cutoff villages, relative to below
    - All villages were unconnected when the bank started operations in our district
    - Most of the above-cutoff ones received roads before the end of our sample; many below-cutoff ones did not

- Key idea:
    - Villagers in above cutoff villages are very similar to those below

Empirical Methodology

- Compare various financing-related outcomes for villagers in above cutoff villages, relative to below
  - All villages were unconnected when the bank started operations in our district
  - Most of the above-cutoff ones received roads before the end of our sample; many below-cutoff ones did not

- Key idea:
  - Villagers in above cutoff villages are very similar to those below
  - EXCEPT that they are much more likely to have received a road in the recent past

Empirical Methodology

- Compare various financing-related outcomes for villagers in above cutoff villages, relative to below
  - All villages were unconnected when the bank started operations in our district
  - Most of the above-cutoff ones received roads before the end of our sample; many below-cutoff ones did not

- Key idea:
  - Villagers in above cutoff villages are very similar to those below
  - EXCEPT that they are much more likely to have received a road in the recent past

- Note that we will not exploit the exact timing of road construction, since that is still likely endogenous

Roadmap

Extensive Margin

Bandwidth	± 200	± 250
	(1)	(2)
Above Cutoff	0.044***	0.028***
	(0.013)	(0.009)
Control group mean	0.051	0.051
Threshold FE	Yes	Yes
R^2	0.0072	0.0088
Observations	8141	9260

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Number of people who get loans substantially higher above population cutoff

Intensive Margin: Loan Amounts

Bandwidth	Panel A: Scaled Loan Amount			
	±200		±250	
	(1)	(2)	(3)	(4)
Above Cutoff	0.027**	0.026**	0.033***	0.033***
	(0.011)	(0.011)	(0.011)	(0.011)
Age(Years)	-0.001**	-0.001**	-0.001**	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)
Household Assets(Lakhs)	0.002**	0.001	0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
School Education	0.003	0.004	0.002	0.003
	(0.006)	(0.006)	(0.006)	(0.006)
Female(1=Yes)	-0.048***	-0.048***	-0.046***	-0.046***
	(0.006)	(0.006)	(0.006)	(0.006)
CollateralIndex		0.004		0.004
		(0.004)		(0.004)
Control group mean	0.055	0.055	0.055	0.055
Controls	Yes	Yes	Yes	Yes
Threshold FE	Yes	Yes	Yes	Yes
R²	0.15	0.15	0.15	0.15
Observations	759	759	792	792

Intensive Margin: Loan Amounts

- Loan amounts substantially higher

- Loan amounts substantially higher
  - loans made to villagers in above-cutoff villages about 55% higher

- Loan amounts substantially higher
  - loans made to villagers in above-cutoff villages about 55% higher

Intensive Margin: Loan Amounts

- Loan amounts substantially higher
  - loans made to villagers in above-cutoff villages about 55% higher

- Note that this is after controlling for all borrower characteristics in our dataset

Other Loan Characteristics

- No substantial difference in other loan features:

Other Loan Characteristics

- No substantial difference in other loan features:
  - Maturity

- No substantial difference in other loan features:
  - Maturity
  - Interest rates

Other Loan Characteristics

- No substantial difference in other loan features:
  - Maturity
  - Interest rates
  - Default behavior

Other Loan Characteristics

- No substantial difference in other loan features:
  - Maturity
  - Interest rates
  - Default behavior

Other Loan Characteristics

- No substantial difference in other loan features:
  - Maturity
  - Interest rates
  - Default behavior

- Indicates loans not riskier or less profitable – consistent with connectivity expanding profitable lending opportunities

Other Loan Characteristics

Bandwidth	±200			±250		
	(1) Ln(Maturity)	(2) ODAmount	(3) %OD Amount	(4) Ln(Maturity)	(5) ODAmount	(6) %OD Amount
Above Cutoff	-0.007	91.374	0.159	-0.008	75.348	0.032
	(0.020)	(75.876)	(0.566)	(0.018)	(70.225)	(0.480)
Control group mean	1.07	61.4	0.19	1.07	61.4	0.19
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Threshold FE	Yes	Yes	Yes	Yes	Yes	Yes
Loanpurpose FE	Yes	Yes	Yes	Yes	Yes	Yes
R²	0.44	0.11	0.068	0.47	0.10	0.065
Observations	370	370	370	386	386	386

- We can differentiate between types of loans made, based on use

- We can differentiate between types of loans made, based on use
  - Productive loans are crop loans, micro-enterprise loans for village shops, or those that are meant for business expansion, asset acquisition, and working capital needs

- We can differentiate between types of loans made, based on use
  - Productive loans are crop loans, micro-enterprise loans for village shops, or those that are meant for business expansion, asset acquisition, and working capital needs

Loan Types

- We can differentiate between types of loans made, based on use
  - Productive loans are crop loans, micro-enterprise loans for village shops, or those that are meant for business expansion, asset acquisition, and working capital needs
  - Non-productive loans are those meant for consumption needs, marriage and festival expenses

Loan Types

	Productive Loans		Non-Productive Loans	
	(1)	(2)	(3)	(4)
Bandwidth	±200	±250	±200	±250
Above Cutoff	0.028**	0.034***	-0.022***	-0.019***
	(0.011)	(0.010)	(0.008)	(0.007)
Control group mean	0.052	0.052	0.045	0.045
Controls	Yes	Yes	Yes	Yes
Threshold FE	Yes	Yes	Yes	Yes
R^2	0.16	0.15	0.15	0.14
Observations	759	792	759	792

- Difference comes entirely from productive loans

- Difference comes entirely from productive loans
- Non-productive Loans are actually *lower* in above cut-off villages

Loan Types

- Difference comes entirely from productive loans

- Non-productive Loans are actually *lower* in above cut-off villages

- Consistent with reallocation from consumption-oriented to production-orientation lending

- Difference comes entirely from productive loans

- Non-productive Loans are actually *lower* in above cut-off villages

- Consistent with reallocation from consumption-oriented to production-orientation lending

- Not consistent with wealth effects driving lending

Demand or Supply?

- Demand-side story

- Demand-side story
  - Higher demand for bank loans in above-cutoff villages to utilize new opportunities

Demand or Supply?

- Demand-side story
  - Higher demand for bank loans in above-cutoff villages to utilize new opportunities

- Supply-side story

Demand or Supply?

- Demand-side story
  - Higher demand for bank loans in above-cutoff villages to utilize new opportunities

- Supply-side story
  - Easier to provide and travel to monitor bank loans in above-cutoff villages

Demand or Supply?

- Demand-side story

Demand or Supply?

- Demand-side story
  - Loan amounts are higher in above-cutoff villages, conditional on borrower having been reached by bank

Demand or Supply?

- Demand-side story
  - Loan amounts are higher in above-cutoff villages, conditional on borrower having been reached by bank
  - Productive loans higher at the expense of non-productive loans

Demand or Supply?

- Demand-side story
  - Loan amounts are higher in above-cutoff villages, conditional on borrower having been reached by bank
  - Productive loans higher at the expense of non-productive loans

- Bank operates on a nodal branch model – villagers come to the branch to seek loans, bank officers typically do not travel to villages regularly to 'market' loans

A Placebo Test

- Comparing similar villages across the population cutoff

A Placebo Test

- Comparing similar villages across the population cutoff
  - Difference: already had roads under a different program that had nothing to do with population-based cutoffs

A Placebo Test

- Comparing similar villages across the population cutoff
  - Difference: already had roads under a different program that had nothing to do with population-based cutoffs
  - Connected and Unconnected villages share similar characteristics (e.g. access to electricity, water etc.) and are located within the same block

A Placebo Test

- Comparing similar villages across the population cutoff
  - Difference: already had roads under a different program that had nothing to do with population-based cutoffs
  - Connected and Unconnected villages share similar characteristics (e.g. access to electricity, water etc.) and are located within the same block

Bandwidth	±200		±250	
	(1) ExtMargin	(2) Loan Amount	(3) ExtMargin	(4) Loan Amount
Above Cutoff	0.007	0.007	0.002	-0.002
	(0.007)	(0.008)	(0.006)	(0.007)
Control group mean	0.052	0.062	0.059	0.070
Controls	Yes	Yes	Yes	Yes
Threshold FE	Yes	Yes	Yes	Yes
R^2	0.0050	0.062	0.0014	0.064
Observations	18332	2237	21372	2649

A Placebo Test

- Comparing similar villages across the population cutoff
  - Difference: already had roads under a different program that had nothing to do with population-based cutoffs
  - Connected and Unconnected villages share similar characteristics (e.g. access to electricity, water etc.) and are located within the same block

Bandwidth	± 200		± 250	
	(1) ExtMargin	(2) Loan Amount	(3) ExtMargin	(4) Loan Amount
Above Cutoff	0.007	0.007	0.002	-0.002
	(0.007)	(0.008)	(0.006)	(0.007)
Control group mean	0.052	0.062	0.059	0.070
Controls	Yes	Yes	Yes	Yes
Threshold FE	Yes	Yes	Yes	Yes
R^2	0.0050	0.062	0.0014	0.064
Observations	18332	2237	21372	2649

- None of our results obtain, in spite of more statistical power in tests

Roadmap

Who Benefits More?

- Results stronger for

Who Benefits More?

- Results stronger for
  - Households that have low assets – especially those without significant cultivable land ownership

Who Benefits More?

- Results stronger for
    - Households that have low assets – especially those without significant cultivable land ownership
    - Lower caste villagers – SCs, STs and OBCs

Who Benefits More?

- Results stronger for
  - Households that have low assets – especially those without significant cultivable land ownership
  - Lower caste villagers – SCs, STs and OBCs
  - Villagers with basic education

Who Benefits More?

- Results stronger for
  - Households that have low assets – especially those without significant cultivable land ownership
  - Lower caste villagers – SCs, STs and OBCs
  - Villagers with basic education

- No differential effect for women, or the young

Who Benefits More?

- Results stronger for
  - Households that have low assets – especially those without significant cultivable land ownership
  - Lower caste villagers – SCs, STs and OBCs
  - Villagers with basic education

- No differential effect for women, or the young

- None of this is due to any government mandate or rule – this is a private sector lender

- Setting buys us clean identification, at the cost of sample size

External Validity

- Setting buys us clean identification, at the cost of sample size
    - We next loosen identification, but extend analysis to all 6 states that followed PMGSY rules, using Central Bank data

- Setting buys us clean identification, at the cost of sample size
  - We next loosen identification, but extend analysis to all 6 states that followed PMGSY rules, using Central Bank data

- Setting buys us clean identification, at the cost of sample size
  - We next loosen identification, but extend analysis to all 6 states that followed PMGSY rules, using Central Bank data

- Results are very consistent: rural lending responds to rural roads, urban lending – within the same district– does not

Roads and Growth: Do Loans Matter?

Dependent variable	Log(GDP)			
	(1) GDP	(2) Agri & Allied	(3) Agriculture	(4) Industry
Log(road$_{t-1}$)	-0.003	-0.017***	-0.017**	0.003
	(0.002)	(0.005)	(0.007)	(0.003)
Δ Rural Credit$_{t,t-1}$	0.008	0.016	0.008	0.011
	(0.014)	(0.022)	(0.028)	(0.011)
Log(road$_{t-1}$) $\times$ Δ Rural Credit$_{t,t-1}$	0.017**	0.080***	0.065**	-0.013
	(0.009)	(0.022)	(0.027)	(0.011)
Year FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
R^2	0.99	0.98	0.97	0.99
Observations	900	900	900	900

Roads and Growth: Do Loans Matter?

Dependent variable	Log(GDP)			
	(1) GDP	(2) Agri & Allied	(3) Agriculture	(4) Industry
Log(road$_{t-1}$)	-0.003	-0.017***	-0.017**	0.003
	(0.002)	(0.005)	(0.007)	(0.003)
Δ Rural Credit$_{t,t-1}$	0.008	0.016	0.008	0.011
	(0.014)	(0.022)	(0.028)	(0.011)
Log(road$_{t-1}$) $\times$ Δ Rural Credit$_{t,t-1}$	0.017**	0.080***	0.065**	-0.013
	(0.009)	(0.022)	(0.027)	(0.011)
Year FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
R^2	0.99	0.98	0.97	0.99
Observations	900	900	900	900

- Rural roads seem to bring growth, especially in agriculture & allied sectors: but only when accompanied by credit flows

Conclusion

- We find that private financing does indeed respond to changes in productive opportunities resulting from road connectivity

Conclusion

- We find that private financing does indeed respond to changes in productive opportunities resulting from road connectivity

- In spite of private-sector rural banking being a relatively new phenomenon

Conclusion

- We find that private financing does indeed respond to changes in productive opportunities resulting from road connectivity

- In spite of private-sector rural banking being a relatively new phenomenon
- Financing productivity increases might see a lot more interest among private lenders going forward

Conclusion

- We find that private financing does indeed respond to changes in productive opportunities resulting from road connectivity

- In spite of private-sector rural banking being a relatively new phenomenon

- Financing productivity increases might see a lot more interest among private lenders going forward

- Lending related to connectivity can have distributional effects, but no evidence to suggest that it worsened inequality, at least at the intra-village level

- Our results seem to suggest broader macro implications on the complementarity between financial and physical infrastructure