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Do road upgrades improve market access & enable agricultural intensification?

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ADB Green Roads seminar, 3 April 2025

Motivation	Context	Data collection	Preliminary results	Conclusion
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Motivation				

► Less than 50% of people in Africa live within 2km of an all-season road AFDB (2014), and high transport costs contribute to low agricultural productivity Suri (2011)

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- ► Less than 50% of people in Africa live within 2km of an all-season road AFDB (2014), and high transport costs contribute to low agricultural productivity Suri (2011)
- Governments and donors invest in larger and more reliable roads
- Well-identified evidence on roads' effects on market access & agricultural intensification is sparse, often concerns larger roads, ignores road quality and is situated in richer contexts.
 - Asher and Novosad (2020); Aggarwal (2018): India 2001-2011; rural feeder roads
 - Faber (2014): China 1990-2007; highways
 - Gertler et al. (2022): Indonesia 1990-2007; existing road upgrades
 - Moneke (2019); Gebresilasse (2020): Ethiopia 2000-2016; rural feeder roads

Motivation	Context
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Preliminary results

Conclusion 0

- ► Do upgrading works of rural roads affect:
 - road quality and reliability?
 - access to markets?
 - intensity of agricultural land use?

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- Identification: compare outcomes along selected and non-selected roads (+ regression discontinuity design using prioritization scores)
- ► Time:
 - road upgrades: 2021-2023
 - data 2017 202X



Motivation 00 Context

Data collection 0 Preliminary results

Conclusion 0



Motivation	Context	Data collection	Preliminary results	Conclusion
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Data collection (since 4/2021) - on the ground \approx and remotely \gg

► Do road works improve roads?

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Do they lead to agricultural intensification?

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Data collection (since 4/2021) - on the ground alpha and remotely alpha

- ► Do road works improve roads?
 - detect road upgrade timing Clark and Matti, 2022 💸
 - record travel speeds on roads in project districts
 - record damages, esp. around river crossings $\ = + \ (\red{A})$
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 - availability & prices of inputs & outputs at weekly markets 34
- Do they lead to agricultural intensification?
 - land use (+ crop choice & land productivity) validation: 🦝

Motivation 00 Context 0 Data collection 0 Preliminary results •00000 Conclusion 0

Detecting road upgrades







Date of detected upgrade

Motivation	Context	Data collection	Preliminary results	Conclusion
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Travel speeds along roads in project districts



Motivation	Context	Data collection	Preliminary results	Conclusion
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Travel speeds along roads in project districts



Motivation	Context	Data collection	Preliminary results
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Conclusion

Traffic along roads in project districts



Multiple visits per road (median=4). Inlcuding FE for enumerators (5). SE clustered at road level. Caps indicate 95%-CI.

Motivation	Context	Data collection	Preliminary results
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Work in progress: Market activity along project roads

► Use high-frequency Nimagery to monitor activity in weekly markets von Carnap (2021)





Conclusion

Motivation	Context	Data collection	Preliminary results	Conclusion
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Agricultural intensification: measurement von Carnap et al. (2020)

 One major margin of adjustment may be land use intensity



Examples of plots in study region

Motivation	Context	Data collection	Preliminary results
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Agricultural intensification: measurement von Carnap et al. (2020)

- One major margin of adjustment may be land use intensity
- Existing land-use measures do not perform well for small-scale farming contexts Venter et al. (2022)



Conclusion

Examples of plots in study region

Motivation	Context	Data collection	Preliminary results
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Agricultural intensification: measurement von Carnap et al. (2020)

- One major margin of adjustment may be land use intensity
- Existing land-use measures do not perform well for small-scale farming contexts Venter et al. (2022)
- Use Sentinel-2 imagery to derive locally-tailored land classification
- With ground-based validation data, show that this outperforms existing alternatives von Carnap et al. (2020)
 - threefold increase in F1-score



Conclusion

Examples of plots in study region

Motivation	Context	Data collection	Preliminary results	Conclusion
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- Ag. intens.: differences in land use around river crossings von Carnap et al. (2020)
 - ► River crossings are particularly vulnerable; discrete jumps in market access

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Ag. intens.: differences in land use around river crossings von Carnap et al. (2020)

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Motivation	
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Context

Data collection 0 Preliminary results

Conclusion

• We analyze a feeder road upgrading program in Northern Mozambique

► Preliminary results:

- Upgraded roads enable higher travel speeds, though often connecting to low-quality secondary roads
- Increased traffic along upgraded roads, mostly two-wheelers
- So far limited evidence for increased agricultural land use
- A combination of ground-collected and remotely-sensed data enables evaluation of a program in an otherwise data-scarce environment.

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