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SHORT NOTE

# HEALTH IMPACTS OF A PUBLIC–PRIVATE PARTNERSHIP RURAL ROADS MAINTENANCE PROGRAMME

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**Abstract:** We provide evidence of health impacts of a public–private rural roads maintenance programme in Peru, which is characterized by a contracting mechanism that employs small local firms. Using a difference-in-differences approach, we find that improved roads connectivity leads to positive health externalities. © 2018 John Wiley & Sons, Ltd.

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**JEL Classification:** H54; H70; O12

## 1 INTRODUCTION

We evaluate health impacts of a public–private partnership designed to maintain rural roads in Peru. The programme is characterized by a contracting mechanism that prioritizes the hiring of small local firms using detailed protocols and where responsibilities and payments are linked to road maintenance quality. It was carried out in 12 departments with high poverty, improved accessibility in 314 districts and contracted with 495 small firms to cover 12 000 km of rural roads and about 3000 km of non-motorized tracks (Escobal, Inurritegui, & Benavides, 2005). The premise is that improved communication reduces time to access facilities and brings health programmes closer to homes thus increasing their effectiveness.

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## 2 DATA AND METHODOLOGY

We focus on interventions performed in 2004 using household and community-level surveys from 2004 and 2006. We use this 2-year window and focus on collaborations between the private and public sector, which as a result tend to be demand-driven.[1] We associate an origin and endpoint village for each road segment. In the case of small roads (less than 20 km), households were randomly selected within each initial and end village. Given hierarchical issues, in the case of large roads, an intermediate village was also included between initial and end village. The 2004 sample cohort of interventions involves 92 treated road segments in 13 of the poorest departments.[2] At baseline, we interviewed 2457 households in 387 villages associated with treatment and control road segments. In 2006, we were able to re-interview 2167 of them, an attrition rate of 11.8 per cent and orthogonal to the treatment. Because road maintenance activities by other parties are not banned in control roads, the impacts we report here are associated with an improved efficiency in road maintenance of the intervention rather than with respect to the absolute lack of maintenance efforts.

We estimate treatment-on-the-treated impacts, as the government-selected treatment roads are not chosen randomly. The control group is selected prior to any intervention and is based on similarities in observables. In addition, control roads are required to be at a minimum distance from treated roads and have no intersections with them to avoid spillovers. Also, control roads are from the same province but from different districts to avoid them belonging to the same network as treated roads. However, it is important to avoid choosing roads that are systematically located at different points of the road network as treated roads. Finally, along with similarities in access to infrastructure, altitude and population, we also argue that the importance of towns is crucial. Thus, if a district capital is associated with a treated road, we look for a comparable road that connects another district capital to a similar ending town. For each treated road, we restrict the search to different districts within the same province. Although the described selection process for the control group attempts to maximize the probability that the control group will be equivalent to the treatment group in all aspects, we cannot discard the existence of potential time-variant unobservable variables that may affect our estimates.[3]

## 3 RESULTS

Table 1 shows results. We find a reduction in the average time required to travel, which amounts to 28 min from an initial travel time of 100 min. The morbidity rate because of illnesses and accidents falls almost four percentage points on average, which is almost nine percentage points for children under five. Similarly, the use of health professionals also shows a statistically significant drop, which would be rather surprising as improved roads make health centres more accessible, which means less need for frequent access.

[1]Ten-year trends prior to the intervention are similar for both treatment and control for several key observables, including schools.
[2]Data come from1999 and 2005 census and a 2006 geo-referenced official roads map, which confirm that there are not statistically significant differences at baseline between treatment and control.
[3]While selection of road segments linked to political considerations, capital or ethnicity cannot be fully ruled out, this is unlikely as most treated rural areas have the same ethnicity, political leaning and income levels.



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Table 1. Rural roads programme impacts on health

| | | Baseline | | | Follow-up | | | |
|---|---|---|---|---|---|---|---|---|
| | Number | Treated | Control | Difference | Treated | Control | Difference | DiD (FE) |
| Travel time in minutes | 235 | 101.45 | 99.55 | 1.90 (11.26) | 69.55 | 84.71 | −15.16 (13.01) | −28.07[1] (16.50) |
| Illness and accidents during last 4 weeks | | | | | | | | |
| All individuals | 7574 | 38.569 | 35.573 | 2.996[2] (1.401) | 30.661 | 31.471 | −0.811 (1.413) | −3.724[2] (1.434) |
| Children 0–5 years old | 1396 | 47.757 | 49.929 | 4.828[1] (2.780) | 35.83 | 38.233 | −2.403 (3.100) | −8.789[2] (3.998) |
| Visit with health professional | | | | | | | | |
| All individuals | 7574 | 21.441 | 19.804 | 1.637 (1.154) | 20.718 | 21.661 | −0.943 (1.165) | −2.591[2] (1.255) |
| Children 0–5 years old | 1396 | 38.368 | 38.442 | −(0.074) (2.673) | 30.063 | 35.271 | −5.208 (2.990) | −8.078[2] (3.972) |
| Access to early childhood development programmes | | | | | | | | |
| Households with children 0–5 years old | 958 | 95.560 | 97.727 | −2.167 (1.529) | 93.243 | 89.318 | 3.925[2] (1.529) | 6.092[2] (2.093) |

Each row comes from a separate regression. Standard errors are clustered at the household level (clustering by road or village shows very similar results and are available upon request). All regressions include household-level fixed effects. Double differences estimates are our impact estimates where
[1]represents statistical significance at 10 per cent and
[2]represents statistical significance at five per cent. Early childhood development includes a daily nutrition basket, food for children programme, food for the sick and the elder and a daily glass of milk programme.


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This is clear when we look at children under five who show an even larger drop in use of consultancy services while also benefitting of a larger access to nutritional programmes regularly managed off health posts (six percentage points).[4] In terms of the cost-effectiveness analysis, a back of the envelope calculation suggests benefits of the programme exceed costs by about 50 per cent.[5]

## 4 CONCLUSIONS

We find that an innovative public–private rural roads maintenance programme in Peruvian rural areas leads to improvements in health-related outcomes. This is especially true for children under five likely because improved connectivity improves access to facilities that provide nutritional supplements.

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[4]Road rehabilitation may increase illness by increasing frequency of contact with sick people. On net, access to care wins over this risk. Our thanks to a referee for pointing this out. It is important to note that in our related working paper (Chong & Valdivia, 2017), we tested several other outcome variables, including income, wages and education, among others and we were unable to find statistical significant impacts in any of them.

[5]Because the effect on productivity is estimated at 6.8 per cent (Murrugarra & Valdivia, 2000), we are able to estimate a total benefit per year of USD 50 000 that compares to the USD 33 000 cost of maintaining a 20-km segment every year (Escobal et al., 2005).



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