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Employment effects of road construction
and access-to-energy interventions –
Evidence from a review of the literature

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Employment effects of road construction and access-to-energy interventions – Evidence from a review of the literature

Key insights – Road construction and access-to-energy interventions are difficult to evaluate, as they are typically not targeted and hence it is not obvious how to identify a valid counterfactual. However, the few studies that deal with this problem in one way or another show that the effects on various dimensions of development are positive. Notwithstanding, the studies also show that the magnitude of impacts is quite sensitive to the context they are implemented in. The evidence on employment in particular is rather mixed ranging from largely positive to insignificant; hence neither roads nor electricity can be seen as a magic bullet to foster jobs.

THE JOB CHALLENGE

Creating new jobs and in particular ‘good jobs’, i.e. jobs in high productivity sectors and offering decent working conditions, is one of the major challenges most low and middle income countries face. According to the 2013 World Development Report on jobs, worldwide 600 million jobs are needed over the next 15 years to keep employment rates at their current level (World Bank, 2012). Governments, non-governmental organisations and donors spend large amounts of money for targeted programmes and broader policies to enhance employment creation and the creation of new firms. Because most employment in low- and middle income countries is in micro, small and medium-sized enterprises (MSMEs), often these firms are targeted by such interventions. Yet, next to targeted policies many countries invest also in untargeted policies with much broader development objectives, which may also have potentially important employment effects – be they explicitly intended or not. This is for instance the case for trade policies, financial sector reforms or large infrastructure projects. Little is known about their leverage on jobs.

SCOPE OF THIS NOTE

This note summarizes the findings from two studies that systematically screened and analysed evaluations of road construction and access-to-energy interventions regarding their employment effects (Lutz, 2013; Mayer, 2014). The studies complement a comprehensive systematic review of studies that evaluated targeted policies, such as access to finance, entrepreneurship training and wage subsidies, commissioned by the evaluation department of KfW Development Bank (Grimm and Paffhausen, 2014). Whereas it was possible to focus solely on rigorous evidence in the review of targeted policies, the review of road construction and access-to-energy interventions applies less strict criteria regarding the robustness of the findings since, obviously, finding a comparison group, i.e. defining a rigorous counterfactual for untargeted policies is often not possible.

WHY WOULD ROAD CONSTRUCTION AND ACCESS-TO-ENERGY CREATE JOBS?

New roads or the improved quality of existing roads reduce transport and travel costs for those who live or work close to these roads and for those that use the

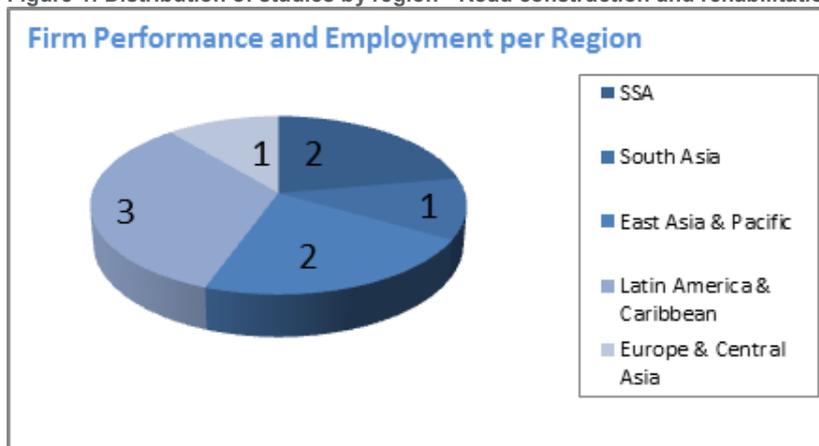
road as a transit. Lower transport and travel costs may lower the costs of reaching input and output markets as well as the labour market. This can have various effects. For firms and farms input costs and transaction costs of market participation will be lowered; hence productivity and market penetration should increase. This in turn should enhance investment, and if substantial enough, lead to new jobs. However, with reduced travel and transportation costs competition increases as well and this may lower output prices and possibly increase input prices. The latter would happen if demand for inputs increases faster than supply. The costs of labour will depend on whether the reduced travel costs lead to an increased inflow or outflow of labour. Moreover, and obviously, the construction of roads itself may lead, at least temporarily, to new jobs. The intensity of these various effects will also depend on whether the quality of transport services also increases with improved roads. For people without own long-distance transport means, positive effects will only materialise if the quality of transport means does also improve (e.g. better public transport).

The underlying causal chain for access-to-energy interventions is less complex. Improved access to energy should lower input costs, increase productivity and enhance investment for both agricultural and non-agricultural production. Increased investment should also lead to new jobs, if it is substantial enough and if the availability of cheaper energy does not lead to the adoption of new primarily labour-saving technologies. In particular for smaller firms the effect on jobs will also depend on whether machines and tools that can be used with electricity are accessible. For instance, if micro and small firms do not have access to credit, these complementary investments cannot be made.

OVERVIEW OF STUDIES REVIEWED

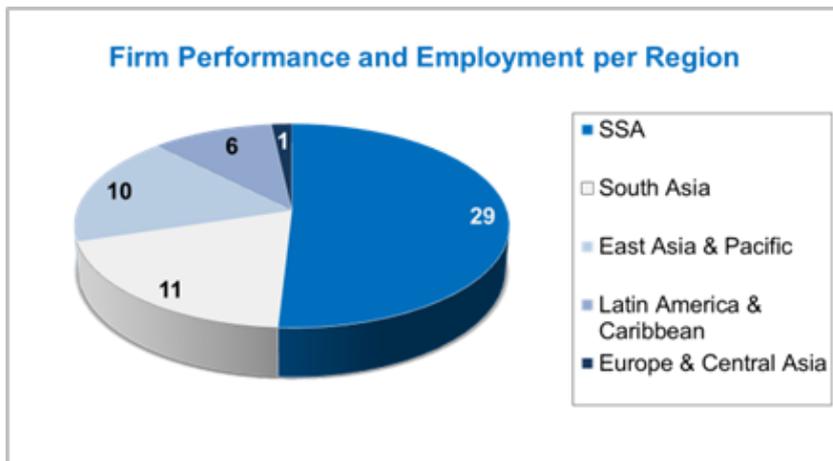
The review on road construction considered in detail eleven different studies covering in total nine projects implemented in the following countries: Palau (Pacific), Nicaragua (two studies, same project), Peru (two studies), Bangladesh (two studies, same project), Georgia, Vietnam, Malawi and Ethiopia. Most projects concern the rehabilitation and maintenance of existing roads. The Malawi study focuses on improved public transport and not on new or improved roads. Most of the studies make use of panel data and thus rely on a simple difference-in-difference framework to identify impacts, i.e. they compare changes in outcomes between those areas affected by road construction and those not affected. The Malawi study is the only one that uses a randomized evaluation design, i.e. observation units are allocated randomly into treatment and control groups. One of the two studies on Peru uses a matching approach in a cross-sectional framework which is typically seen as a weaker evaluation design, as it is difficult to ensure that treatment and control units are similar and hence that any observed differences in outcomes can be attributed to the intervention under study.

Figure 1: Distribution of studies by region - Road construction and rehabilitation



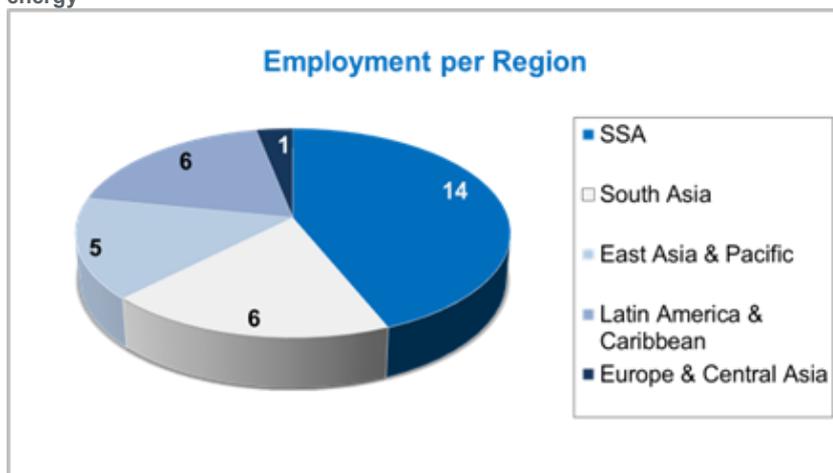
The review on access-to-energy interventions draws on a much larger and broader set of evaluation studies. In total 32 studies were identified and examined, although only 13 out of the 32 use a quasi-experimental design to construct a counterfactual. All other studies rely on simple regression-based comparisons. But many of these mobilize additional qualitative evidence to strengthen their findings. None of the studies is based on an experimental design. In sum it means, that the general findings have to be synthesized and interpreted with care as there is a relatively high risk that the findings may be biased by potentially confounding factors, i.e. factors that affect both treatment status (access-to-energy) and economic outcomes.

Figure 2: Distribution of studies by region - Access to energy



Eleven out of the 32 studies directly assess employment effects. Employment effects include effects on firm creation, wage and self-employment, as well as working hours. The included evaluations cover in total 45 projects, 33 on-grid connections and 12 off-grid connections. A bit less than half of the studies examine projects implemented in Sub-Saharan Africa. The rest is equally divided over South Asia, East Asia and the Pacific, and Latin America and the Caribbean. One study evaluates a project in Eastern Europe.

Figure 3: Distribution of studies assessing employment effects by region - Access to energy



KEY-FINDINGS ON ROAD CONSTRUCTION

The evaluation studies suggest that in general road infrastructure interventions increase employment, mostly wage employment but to a smaller extent also self-

employment. All studies show positive impacts in this respect, if employment is defined relatively broadly, including the set-up of new firms and hours supplied. No study shows significant negative employment effects. The results are driven by both: an increased availability of input factors including labour and better access to output markets, although only few studies offer such detailed insights into the transmission channels. Not surprisingly, besides the importance of the road, the magnitude of job creation depends also on contextual factors such as other types of infrastructure, the economic structure in terms of the share of value added generated in the primary, secondary and tertiary sector, education and population density. The existence and development of transport services is another important co-factor that can increase the return from road construction. Some of the studies also nicely show that in the stage of project design planners should carefully assess what type of road is most needed and whether new roads need to be built or whether existing roads can simply be renovated. The evaluations also show that road infrastructure projects need time to develop their positive effects. This is particularly the case if projects are designed to serve an anticipated larger demand in the longer term. Many of the evaluations are not designed in a way that they would allow to account for long-term effects. Only two studies explicitly explore medium and longer term effects, i.e. effects three to five years after the project was completed (Khandker and Koolwal, 2011; Mu and Van de Walle, 2011).

Overall the studies draw a rather positive picture regarding the effects of roads. Khandker et al. (2009) based on a quite solid panel data approach show that in Bangladesh the rehabilitation of rural roads has reduced poverty by raising agricultural production, wages, output prices and by lowering input and transportation costs. Interestingly the findings also suggest that impacts were higher among the poor relative to the non-poor. That effects differ by poverty status has also been shown by Lokshin and Yeemtsow (2005) for the case of Georgia, though in their study effects are not systematically higher for the poor. They show for example that off-farm employment increased in particular for the non-poor, in contrast female employment increased for poor women only. Mu and Van de Walle (2011) also document generally high impacts for rural Vietnam, again somewhat higher for the initial poorer communities. They emphasize for instance increased market integration and income diversification.

Table 1: Employment effects of road construction and rehabilitation (firm performance and employment effects)

Note: Significance is based on the 10% level.
Source: Mayer (2014)

Type of intervention	Countries covered	# of studies	# of studies showing significantly positive effects
Rural road construction (possibly including rehabilitation and maintenance)	Palau, Vietnam, Nicaragua	3	3
Rural road rehabilitation and maintenance (no new construction)	Bangladesh, Georgia, Peru (2), Ethiopia,	5	5
Improvement of transport services	Malawi	1	0

KEY-FINDINGS ON ACCESS-TO-ENERGY

The evaluations that have explored the effects of access-to-energy interventions are a bit broader in scope than the road construction projects, i.e. they typically look at a quite large and diverse set of outcomes. Focusing on firm performance (including profits, revenues, productivity and product diversification, investment) and employment as outcomes, the review shows that in about half of the 92 cases considered, (stemming from the 32 studies covering 45 projects) improvements in business performance or employment take place. Positive effects on employment do not occur significantly more often than positive effects for the other performance measures. They are also not significantly more often negative so that it can be ruled out that access-to-energy tends to substitute labour through electricity-driven machines.

For South-Africa, for instance, Dinkelman (2011) finds relatively strong effects of household electrification on women's labour market participation. Barron and Toro (2013) find somewhat smaller effects for El Salvador. Van de Walle et al. (2013), Lipscomb et al. (2013), Khandker et al. (2013) and Chakravorty et al. (2013), all provide some evidence that electrification opens up new business opportunities or increases the productivity of existing businesses. However, overall the evidence is mixed. In 57.1% of the cases where the effect on wage-employment or self-employment is assessed the effects are significantly positive; in 42.9% of the cases they are insignificant (sometimes also negative). If business creation is considered as outcome, 46.7% show a positive effect and 53.3% show a negative or insignificant effect. If there are positive effects, they arise first of all for medium-sized and larger firms. Whereas firms of a certain size always can make good use of electricity this is less obvious for micro and small enterprises. First, there are many small-scale very specific activities such as street vendors, transport services etc. that have no need for electricity. Second, micro and small firms often face multiple constraints which need to be solved simultaneously to enhance performance. For instance micro and small firms often lack access to necessary financial resources or credits to invest in machines that can be used with electricity. So the main benefit then remains light, which may help to extend the working hours; an effect which is indeed shown to be important in several studies. The review also revealed that positive results were more often obtained in rural areas and for outcomes that directly relate to women, e.g. female employment as opposed to male employment.

POLICY IMPLICATIONS

Taken together the reviewed studies show a robust positive impact of (rural) roads on households, and especially the poorest. However, the evidence is always shown for a subset of all considered outcomes and this subset differs quite a lot from one country and context to the other; i.e. for each specific outcome of interest only limited number of impact estimates is available. Also the transmission channels vary across studies and projects. Not much is known about the timing of the effects, but the few studies that consider short and longer term effects suggest that longer term effects are typically larger, provided good maintenance is in place.

Table 2: Employment effects of access-to-energy interventions (only studies that assess employment effects)

Note: Significance is based on the 10% level.
Source: Lutz (2013)

Type of intervention	Countries covered	# of studies	# of studies showing significantly positive effects
On-grid access	India, Vietnam, Lao PDR, Indonesia, Bangladesh, Benin, Uganda, Namibia, Tanzania, Zimbabwe, Ghana, South Africa, Colombia, Peru, Nicaragua, Guatemala,	20	12
Off-grid access	Albania, Bulgaria, Ecuador, Guatemala, Nicaragua, Panama, Malawi, Ghana, Kenya, Namibia, Nepal, Vietnam	5	3

The same is true for access-to-energy projects; overall the findings are quite positive, but they differ again quite substantially across projects and countries. Interestingly, compared to road construction and maintenance projects, access-to-energy projects seem to be less pro-poor. One explanation for this finding is that very often connection costs and user fees are still quite high. Many of the reviewed studies show well the complementarity of roads and electricity with other public goods and services.

Regarding the benefits of roads it should be kept in mind, that transport prices depend only partly on transport costs and road quality; they also depend on the market structure of the involved industry. Profit mark-ups and cartelization seems to be a particular problem in Sub-Saharan Africa (Beuran et al., 2013). It also depends on the share of transport costs in total input costs. If this share is rather low, even major reductions in transport costs can obviously not have a big impact. Finally, often road and electricity projects are very expensive, because of high input costs and bad governance in the provision of public goods which further reduces the cost-effectiveness of such interventions.

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