Infrastructure Investment for Poverty Reduction: A Survey of Key Issues
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Infrastructure, Growth and Poverty Reduction: The Macro Dimension

The links between infrastructure investments and economic growth and between growth and the incomes and welfare of the poor have often been studied in separate strands of the econometric literature. Broadly speaking there is an understanding of a positive relationship between infrastructure investment and growth and of growth typically being associated with falling poverty. This is unlikely to be a simple unidirectional set of relations as feedback between higher income and the demand for infrastructure services and between poverty and inequality and growth are possible and must be allowed for in any rigorous model specification (Willoughby 2002). Infrastructure’s relations with the poor can be seen in both direct terms—through changes in distribution—and indirect through the wider growth effects and higher economic activity stimulated by infrastructure (Ali and Pernia 2003).

These general relationships need to be examined in considerably more detail to derive meaningful policy prescriptions. Researchers at the International Food Policy Research Institute (IFPRI) have examined the impact of various categories of public expenditure (using the broad classifications of roads, irrigation and electricity, for example) on both economic activity and poverty reduction, allowing for interactions and reverse causality, in a sophisticated simultaneous equation model. Their model has now been applied to several countries (Fan 2003). Their results indicate the marginal return to different categories of public investment, for a given portfolio of complementary activities, in terms of both change in GDP and poverty impact. Across several countries a number of important points emerge:

- first and most basically there is a wide range of growth and poverty impacts as between different categories of public expenditure with the important implication that a re-allocation within the public investment budget from lower to higher return activities can create substantial benefits;
in different economies with different structural features the ranking of types of public investment varies; however in both India and the People’s Republic of China (PRC) the infrastructure investment with the greatest impact on poverty reduction is rural roads;

irrigation investment has a relatively weak impact on poverty reduction in both India and PRC, reflecting earlier high levels of investment in the sector, whilst investment in rural power supplies has a weak impact in India, where the network is well developed, but a strong impact in Thailand where rural electrification is a serious constraint to growth and hence poverty reduction;

specific poverty expenditure programs in both India and PRC appear to have only a very weak impact on the numbers in poverty; a striking result is that in India spending per million Rupees on roads generates at the margin 7 times the poverty reduction impact of the same million Rupees spent on anti-poverty programs; in PRC the order of magnitude is smaller but the message is the same with 3 times the poverty impact from road expenditure as compared with poverty loans; poor poverty targeting in a technical sense combined in some instances with governance issues, leading to high leakage to the non-poor, are the explanations put forward;

where regional within-country disaggregation is possible returns to public investment in terms of both growth and poverty reduction are considerably higher in poorer areas; in PRC investment in all types of infrastructure has a considerably greater return in terms of poverty reduction when these investments are made in the poorer Western region; district-level analysis for India confirms this pattern with higher returns from road investment in poorer rain-fed as compared with irrigated areas.

This analysis which has now been conducted for a range of countries is a powerful means of understanding the magnitude of the links between infrastructure and poverty. However, a few qualifications are appropriate.
Some Qualifications

First, it is clear that for data reasons much of this econometric work has to be conducted at a fairly aggregate sector level; ‘roads’ is a very broad category and even within this a focus on rural versus urban or good quality versus low quality roads—is still at a very broad level. Hence there is ample scope for intra-sector and project-level comparisons. Simply a relatively low ranking of say irrigation in growth and poverty reduction terms does not mean that some irrigation projects may not have high returns by both criteria under particular circumstances.

Second, the returns to particular categories of infrastructure investments should in principle vary with the complementary assets available. The marginal returns cited in these estimates take as given the existing complementary portfolio. Other econometric work on growth-poverty relations also brings out the fact that for a given infrastructure investment either over time or over space (in this case roads in the Philippines) has higher returns when combined with higher education expenditure (Balisacan and Pernia 2002). This point on complementarity is also brought out in the recent work on ‘geographic capital’ and ‘spatial poverty traps’, which suggests that due to important externalities returns to similar household assets can be much lower in some locations than others. This provides a conceptual rationale for the targeting of a package of infrastructure measures (for example rural roads, irrigation and health and education services) in poor area programs. Hence whilst the IFPRI data show higher returns to marginal investments within relatively backward areas, complementary results indicate that within these areas (for example the Western region of PRC) returns to a given unit of additional infrastructure are higher where a package approach to investment is pursued.

Third, the relatively weak impact of poverty loan programs in comparison with conventional infrastructure investments is striking. It may be due to poor implementation, but it may also in part be due to the specification of the econometric model used by IFPRI, since it appears that unlike infrastructure investments, which affect the poor both directly, principally through their employment effect, and indirectly through their
growth effect on other sectors, poverty loans do not appear to enter as a term in the equations for productive activity, so by definition will only have a direct effect. The expenditure headings under poverty loans therefore appear conceptually as transfers with no sustained growth consequences. Under these circumstances the relative rankings are not surprising. What would be of greater relevance to the debate on targeting versus general infrastructure activity would be a comparison of the impact of targeted versus non-targeted infrastructure investment. It does not appear that the data allow this particular comparison.

Ex Ante Project Level Assessments

Whilst macro level analyses have been extended significantly in recent years project work retains a relevance not just for international organizations seeking to assess the full impact of their funds but as a means of understanding the mechanisms through which investments can impact on the poor. ADB has experiment with various project classifications and techniques. At a conceptual level where possible it either attempts to identify a headcount of beneficiaries (ie what proportion are poor) or a poverty impact ratio (ie what proportion of monetized benefits go to the poor) (Prakash 2003). Road and rail projects in PRC provide an example of this approach where location of a road or rail link across a poor province alone cannot be taken as prima facie evidence that an investment is pro-poor and there is need to estimate the poverty profile of transport users (Curry 2003). There have also been attempts to introduce relatively labor-intensive construction methods for ADB highways in PRC, although how far it is economically sensible to use these methods as a means of reaching the poor and the scale of impact are unclear. Further, insistence on use of these methods can conflict with competitive bidding procedures.

However, for many infrastructure activities the substantive distributional effects may arise outside the boundaries of the project itself and thus not be amenable to influence by those designing or managing projects. A clear example of this are peri-urban road projects in countries where there are active land markets. Benefits identified at the project level will
conventionally be in terms of vehicle operating cost savings and the benefits associated with generated traffic. Who actually receives these will depend in part on the competitiveness of the transport sector concerned—for example whether lower vehicle costs result in lower freight charges or higher profits for freight operators—and how far the gains from vehicle cost savings are translated into higher demand for land in the vicinity of the road.

In the context of developed economies there is a substantial literature on how benefits from road projects can be transferred to the owners of land as prices are bid up in response to the improved access the road project allows and there is also evidence of this phenomenon in the development context, particularly in middle income developing economies (Londero 2003). This means that in practice many of the benefits of urban highway projects may be captured by the better-off, particularly land speculators.

Similar reasoning can apply to directly targeted urban programs like slum clearance. In this type of situation policies to redistribute project benefits require interventions such as the introduction of toll charging or property taxes; the first would lower benefits to roads users and thus weaken the impact on land prices, whilst the second would transfer some of the income from higher land values from the land-owners to the government. In principle either method could allow some redistribution to the poor.

Highways across rural areas offer the potential for greater direct gains to the poor since there is the potential for rural feeder roads that link the poor as consumers, suppliers and workers with markets. This has conventionally been seen as the major gain to the poor from road activity (and is the mechanism that presumably underlies the econometric results reported above). Here the conceptual problem in ex ante work lies in estimating the net economic value of the incremental production that lies behind the generated traffic projections associated with feeder roads and allocating a proportion of this to the poor.

**Direct Impacts on the Poor**

The poor are users of infrastructure services and there is ample evidence that they themselves value such services because of the link to markets and
access to health and education facilities, such as schools and clinics (see for example the preliminary discussion of village-level surveys in rural Thailand summarized in Cook, 2003). It is also important to remember that many social sector projects have significant direct infrastructure components—for example in terms of road and power costs; DFID estimates are between 40-60% for some activities (Lucas and Grimes 2003). However, equally in many cases the poor are inadequately integrated into infrastructure systems—in most cases having no direct water network or power grid connections in their homes. Also it is well known that the tariff structure in many countries offers significant subsidies to urban consumers, whilst the poor often pay significantly greater amounts per cubic meter of water or kilowatt-hour of power from informal private suppliers. Focusing infrastructure delivery on the poor at the very least requires the removal of the highly regressive subsidies that persist in a number of countries, particularly in the water and power sectors.

However, planning for a greater poverty focus in infrastructure delivery may require a consideration of the different product characteristics of various services. At their income level the poor will not require the same quality standards (e.g. water at constant pressure is necessary for dishwashers but not for hand washing) or service reliability (fluctuations in power levels will not be important where sophisticated electrical products such as computers are not in use). In some instances it may be possible to separate network service delivery by income level (Londero 2003). In other cases it may be that the poor are best served by smaller scale, often informal, private service suppliers. Here it will be important to ensure that government regulation strikes the correct balance between ensuring health and safety standards and avoiding the creation of regulatory barriers to entry by private suppliers. DFID initiatives in several countries aim to encourage this form of ‘appropriate’ or ‘intermediate’ supply, as well as active community participation (Lucas and Grimes 2003).

In thinking about the impact of infrastructure investments on the poor it is helpful to bear in mind the dynamic concept of poverty that has been brought out in the recent literature that distinguishes between the chronic (or long-term) and transitory (or non-permanent) poor (Sawada and Shinkai
The chronic poor lack assets and may often suffer from discrimination and disability. The transitory poor are vulnerable to negative shocks, although their capital base will be stronger. It is an important issue how far infrastructure projects can address the needs of both groups. Sawada and Shinkai (2002) find that rural irrigation facilities in Sri Lanka can be an effective tool for reducing both types since it not only raises permanent income, but also reduces expenditure fluctuations in the dry season, which may cause households to slip into poverty. However, more generally it is also possible that in some instances the very poorest may not have the assets or otherwise not be in a position to respond to the opportunities created by new infrastructure activities (lack of access to land or credit being obvious economic constraints, whilst physical disability or ethnic exclusion may also be an issue).

Not all infrastructure schemes aimed at addressing transitory negative shocks on the poor—for example through work creation measures—have been effective. Maxwell (2003) describes a scheme introduced in the aftermath of the Financial Crisis in Indonesia—essentially to create employment through the construction of labor-intensive infrastructure. The impact of this scheme was mixed with some income clearly going to the intended beneficiaries, but also in some cases a relatively high leakage rate, due to the ‘capture’ of the implementation of the scheme by loan elites.

In principle there is also the possibility that in the short-term some of the poor may be made worse off by infrastructure investments. Cook (2003) in reporting the surveys of the rural poor in Thailand notes that 10% of the ‘ultra poor’ households felt they had been made worse off by recent road improvements. The intuitive interpretation of this is that the previous poorer communications in the area provide a form of ‘natural protection’ for the livelihood strategies of this group and that faced with the competition created by better transport links their prior activities became uncompetitive. Such negative consequences are not paradoxical, since a process of market opening will have a range of effects, but they must be planned for and mitigatory measures built into the projects concerned. For the Philippines the conclusion is that whilst there is econometric evidence that roads and power investment are positively associated growth and irrigation appears
to have a positive redistributive effect, on its own infrastructure investment is a very blunt instrument for reaching the poor, particularly where the complementary package of measures needed to maximize the impact of a given unit of infrastructure spending are weak or missing (Balisacan 2003).

**Institutional Change, Sector Policy and Pro-poor Infrastructure: The Missing Link?**

There is general agreement that changes to infrastructure provision in a pro-poor direction require a fresh look at the institutions that run infrastructure sectors and the policy environment in which they operate. From a financing point of view in Asia private finance has been slow to move into most infrastructure sectors—viewing these as high-risk ventures. Road projects, in particular, have high initial investment costs, and produce only a quasi-private good. At present in developing countries as a group the private sector finances less that 30% of total infrastructure investment (and much of this figure is concentrated in a small number of countries), and the public sector finances the bulk of the residual with concessional aid taking no more than 3% (Pernia 2003). Hence the impact of decisions on aid-financed projects per se will be very weak unless project analyses are able to influence thinking at the sector policy level. These statistics also bring out the continuing key role of public sector institutions, as well as the government regulatory agencies that set the terms for private involvement. Three features of current thinking on sector planning can be highlighted (Willoughby 2003).

First, the need for a restructuring of tariff policy to avoid highly regressive subsidies, particularly for better-off urban consumers and to generate the revenue needed for adequate levels of maintenance. However, this has been a persistent topic of discussion for at least the last 30 years across a range of sectors and regions, and the fact that the debate continues, whilst the technical arguments have been long understood, serves to highlight the real political economy obstacles involved.

Second, the need to involve greater private sector participation, both as a source of finance and as a creator of efficiency improvements. As
noted, in Asia this remains a serious challenge. It will require in many instances a revision of regulatory frameworks to encourage alternative supply sources in all but natural monopoly sectors. Again, as noted above, in recognition of the different standards of service that consumers at different income levels need this will entail a ‘multi-tiered regulatory structure’, which is light for small scale private suppliers, often serving the poor, but increasingly demanding for larger suppliers, who operate as conventional utilities.

Third, recent discussions give considerable prominence to improved two-way communications between infrastructure suppliers, whether public or private, and their customers. In the poverty alleviation context this requires a dialogue with the poor and their community representatives on their needs and concerns. From this perspective the role of sector regulators should be as ‘effective advocates of the needs of the poor’, which in many countries would be a radical departure from existing practice (Willoughby 2003).

Nonetheless how far large-scale private suppliers—for example in water and power—will emerge to serve the needs of the poor, particularly in inaccessible low-income areas, remains to be seen. Private infrastructure provision may induce efficiency gains for those already connected to formal infrastructure networks, but it is not a simple panacea for reaching the poor and some form of public provision will almost certainly remain important in most countries.

Conclusions

The policy lessons that emerge from these discussions are at one level quite obvious.

1. There is ample evidence that infrastructure investment matters both for economic growth and poverty reduction.
2. The precise impact of various investments will be strongly influenced by a range of complementary factors (for example, the return to a rural road will be higher where there is both irrigation and a good school).
3. Good policy at the sector level (for example in terms of pricing, taxation and regulation) will have a critical influence on who benefits from infrastructure and how far the poor can be involved.

4. New private infrastructure provision is to be encouraged, although it will entail a new regulatory apparatus and will not always reach the poor.

Further Research

Further research, to which the ADB Institute plans to contribute, can probe beneath some of these general propositions. For example, two potential areas that emerge from this survey are:

- *The small scale private infrastructure sector*—given the role it is argued that private providers can and in some cases do play in reaching the poor, it is appropriate to examine for particular countries or sectors how this relationship works and what the constraints are on improving private infrastructure supply to the poor. It is anticipated that this work will be done by the ADB Institute in Cambodia and Lao PDR as part of a study on Making Markets Work Better for the Poor.

- *Pro-poor institutional development*—given the importance placed on institutional change, it is an important question what models of institutional development and regulation in infrastructure sectors are available to countries of the region. Experience in Latin America provides a possible reference point and can be used to identify possible ways forward in Asia, particularly in the light of the need to reach the poor in as effective a manner as possible.
Online References

Majority of these references and conference presentations are freely available in full text online at www.adbi.org


S. Fan (2003) ‘Public Investment and Poverty Reduction: What have we learnt from India and PRC?’


J. Maxwell (2003) ‘Small Scale Rural Infrastructure Projects and Poverty Reduction: an example from Indonesia’ power-point presentation

E. Pernia (2003) ‘Infrastructure and Poverty Reduction—what is the connection?’ power-point presentation


C. Willoughby (2003) ‘Can Public Infrastructure Institutions be Leading Agents for Pro-Poor Growth?’