TRANSPORT PROJECT APPRAISAL AT THE WORLD BANK[1]

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Introduction: Economic analysis in the World Bank

1. The first paragraph of the World Bank's ***Handbook on Economic Analysis of Investment Operations*** states "the main purpose of project economic analysis is to help design and select projects that contribute to the welfare of a country". It goes on to point out that it is most useful when used early in the project cycle, and very limited use when used solely as a single figure hoop through which projects must jump once prepared.[2]

2. The position that is adopted in the ***Handbook*** sees economic analysis as something much broader than traditional cost/benefit analysis. Indeed, the handbook lists ten questions which an economic analysis should answer, namely

   (i) What is the objective of the project?
   (ii) What will happen if it is implemented, and what if it is not?
   (iii) Is the project the best alternative?
   (iv) Are there any separable components, and how good are they separately?
   (v) Who are the winners and losers?
   (vi) Is the project financially sustainable?
   (vii) What is the project's fiscal impact?
   (viii) What is the project's environmental impact?
   (ix) Is the project worthwhile?
   (x) Is this a risky project?

   In addition, it is necessary to analyze, in economic terms, whether the project is better carried out in the public or private sector.

3. Clearly not all of those questions are what are normally considered as economic questions in a narrow sense, and they might more appropriately be regarded as the components of the overall evaluation. In understanding how the Bank interprets and applies those general observations on its use of economic analysis it is important to recognize the very particular characteristics of the Bank and its relationship to its clients in terms of the processes through which a loan emerges, and the procedures which are involved at each stage of the project cycle.

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[1] The views expressed in this paper are solely those of the author and do not necessarily represent those of the World Bank, its Executive Directors, or the countries they represent.

[2] Belli, P., J. Anderson, H.Barnum, J.Dixon and J-P Teng. *Handbook on Economic Analysis of Investment Operations.* The World Bank January, 1998.

The process of project definition.

4. To understand the process of project definition it is important to recognize the very nature of the Bank itself. As an international development institution, managed by a Board representing the interests of both borrowing and donor member countries, it has the obligation to engage in activities which are designed to serve the best long term interests of all its members, and not just to engage in such lending as represents the most profitable, or even the most secure, use of the resources available. The implication of this is that it does not engage explicitly in a process of ranking all of the investment opportunities which are open to it. Instead, it has to seek a political balance in directing its resources to assisting member governments to achieve their national objectives, primarily by making the best use of their own national resources to which Bank lending is a supplement. For that reason, much emphasis is placed on the institutional and regulatory environment into which the bank is lending. Project lending which contributes to improvement of that environment is thus of particular interest.

5. To some extent, judging the extent to which that is being achieved depends on some of the high level priorities which the Board of the Bank have adopted. These include the avoidance of environmentally damaging investments, the widespread distribution of the benefits of projects throughout the national recipient community and the avoidance of uncompensated losses by virtue of spatial or occupational displacement resulting from a project. Strict standards are applied both to the environmental design of projects, which have to have formal environmental clearance before they are submitted for Board approval, and to the resettlement and involuntary employment severance. The requirement to attend to distributional aspects is increasing as the Bank concentrates further on its poverty reduction objective.

6. All of that contributes to a broadening of the format of project appraisal, and in a sense to attenuate the more conventional use of any strict ranking procedures based on traditional cost / benefit ratios. But in a different sense conventional economic evaluation has remained central to the appraisal process as there remains an extremely strong instinct to avoid “white elephants”, particularly those emanating from political glory seeking. It is very difficult to imagine an infrastructure project which had been subject to formal economic appraisal being accepted by the Board if it did not satisfy the conventional 12% minimum internal rate of return test.

7. The process through which that is pursued is essentially one of progressive refinement of the understanding of national priorities. At the start of the process has been the identification, jointly by the country and the Bank of a “Country Assistance Strategy” (CAS). This document identifies both the borrowing capacity of the country, in both fiscal and administrative senses, and given the definition of such an envelope, the areas of high priority where the Bank is thought able to contribute best to achieving national development objectives. This is reflected at project appraisal stage by a requirement to demonstrate what value is added particularly by the Bank’s involvement in project finance. During the last two years attempts have been made to broaden this country level priority setting within what is called the “Comprehensive Development Framework” (CDF) in which the involvement of all other potential

sources of aid or lending are incorporated to identify how the activities of the various external agencies might be better focused and coordinated. For the highly indebted poor countries (HIPCs), the country level poverty reduction strategy will increasingly be the context within which sector strategies and interventions will have to be seen

8. Where the transport sector is identified as a priority for assistance there is usually a sector review , within the World Bank, which focuses further on the transport sector, including consideration of the institutional and regulatory impediments to its effective development, and from which individual projects are in principle derived. This is referred to as Economic Sector Work (ESW). Individual projects are then initially identified and presented for internal consideration in the Bank in a "Project Concept Document" (PCD) If the general handbook principles were fully observed it is at this stage that formal economic evaluation would play its fullest role. In practice the economic evaluation at this stage tends to be at a sketch model level. The full economic justification, including that of the selection between alternative actions, has then to be more fully worked up for inclusion in the Project Appraisal Document (PAD) Within this document, which is the basis for presentation for Board approval, a logical framework (logframe) indicates the way in which projective objectives, project components and outcomes are related, and identifies the main perceived risks and the elements of the project design to mitigate such risks. A summary of the full economic evaluation must be included. Demonstration of the consistency of the project with the CAS objectives must also be formally shown in the PAD. The final details, including any covenanted conditions, are agreed in a negotiation between the borrower and the Bank, and the agreed package presented to the Board.

9. Subsequent to this, periodic supervision reports (Form 590) record the performance of the loan during disbursal, but do not contain any formal economic evaluation. At the closing of the loan (completion of the disbursal of the loan funds) the economic evaluation is revisited and a reassessment made of the expected rate of return at that stage in an Implementation Completion Report (ICR). About 25% of projects are further subject to a Performance Audit Report (PAR), on average about three years after completion, by the Bank's internal, but quasi-independent Operations Evaluation Department (OED). Even that, of course is not an ex post assessment of the economic rate of return over the projected full life of the project.

Essential Elements of Economic Evaluation in the World Bank

10. Both of the normal decision criteria of Net Present Value and Internal Rate of Return are computed. However, because the primary concern of the Bank is to avoid white elephants these criteria are not used in the final appraisal in any very sophisticated form. A positive net present value would normally be required on the basis of a nationally accepted discount rate (usually 12% is adopted), and an internal rate of return of 12% or more would normally be required. It is the latter number which tends to be focused on in satisfying the "no white elephants" objective. Although some commentators have argued that this is too high, the general view appears to be that funding is sufficiently scarce, and the real opportunity cost of capital so high, that it is appropriate to set of such a relatively high cut-off rate. Subtleties concerning the difference in rankings between NPV and IRR based procedures, or about adjustment

of the IRR to account for real re-investment possibilities, emerge only rarely, usually in respect of the selection between alternatives. The real effectiveness of this device for avoiding wasteful investment is, of course, limited by the underlying fungibility of finance, through which countries may substitute Bank for domestic funding of "good" projects in order to release domestic funding for politically motivated "white elephants". Occasionally, and usually in the case of very poor countries which are heavily dependent on external funding, it is felt both necessary and possible to defend against this through covenanted loan conditions.

11. For most transport projects the major element of economic benefit arises in the form of vehicle operating cost savings, the level of which depends critically on the level of traffic. The procedures used for forecasting traffic in Bank funded projects varies greatly between projects. In some cases, for example for some recent urban projects in Brazil, there is a well established data base and traffic model available locally. But growing attention has been given to traffic forecasting, especially in urban transport operations. In China, for example, a great deal of effort has been made for improving the application of network-based urban travel demand model in traffic forecast under alternative scenarios. While spatial database and travel demand models are available in some client cities, the quality of the data and model is still rudimentary. A major effort is therefore being made to help the clients to improve the capability of their models to respond to various policy parameters. More usually, however, traffic forecasts have to be constructed on an ad hoc basis for individual projects

12. Benefit estimation usually follows generally accepted procedures of estimation of flows and link performances with and without the project. For road projects these are converted into aggregate benefits using standard national vehicle operating cost and benefit valuation conventions for such "intangibles" as time and pain and grief costs of accidents or loss of life, if available. Where such national standards are not available operating cost values may be constructed synthetically using HDM operating cost model parameters and time values follow default value recommendations in the World Bank infrastructure note. The most common systematic structure for benefit estimation is probably seen in the application of HDM to road maintenance and rehabilitation projects.

13. The recommendation in the bank *Handbook* is that economic evaluation should be undertaken at <u>domestic prices</u>, in <u>real terms</u>. The general implications for adjustment of market prices are as follows:

    - All market prices should be adjusted to be net of taxes or subsidies;

    - The non-labor resource cost of non-tradable commodity or service inputs need no adjustment

    - Border prices (c.i.f. for imports, f.o.b. for exports) for internationally traded goods need adjustment in proportion to the ratio of the official exchange rate and the market rate.

14. Those are not the only departures from market pricing that are necessary. The use of current wage rates may substantially misrepresent the real cost of labor. On the one hand, if there is substantial underemployment of unskilled labor, particularly in the presence of minimum wage legislation, then the real cost is less than the money wage because the real opportunity cost is not what can be earned elsewhere at the controlled wage, but the value to the individual of earnings in informal employment or the value of his leisure time. On the other hand, at prevailing remuneration rates many developing countries have severe shortages of skilled labor, which should therefore logically be assigned a premium value. The issue of the value of labor is particularly relevant to the selection between labor intensive or capital intensive production technology such as in road maintenance or rehabilitation. In practice subtle differentiation of labor valuation tends to be restricted to applications where the issue is likely to be critical. Otherwise, the tendency is increasingly to use market wage rates.

15. There are also three main "intangibles" for which market valuations are not directly available. There has been a tendency in the past to treat savings in operating costs in transport projects as more "real" than savings in time. Rates of return have therefore sometimes been estimated initially excluding time values, and enhanced rates including time valuation given as an extra. To justify a project without recourse to time savings was viewed as a test of virility or robustness. That is changing. Time savings are accepted as a legitimate element of benefit as a matter of course. There is a sector guidance note which recommends the estimation of local values, but also suggests some default principles of evaluation in the absence of such local values. In the coming year it is intended to produce a guidance manual on the derivation of local values through the inclusion of relevant stated preference questions within social surveys undertaken in project preparation.

16. The valuation of accident cost savings has been even more controversial. While there has been no objection in principle to the inclusion of the non-human resource cost benefits of accident reduction, the question of valuation of pain and grief, and in the extreme, loss of life, has been very controversial. That is partly because of the potential to misunderstand the position of the Bank in the event that the values attached to life appeared to be very low. Hence, despite the availability of some very clear and explicit tests on how to value life savings, and what those valuations have generated, there is no explicit Bank guidance on the matter. The minimum position, consistent with the view that the Bank is assisting client countries to make effective use of their own resources, is to accept within the evaluation of projects for Bank funding, valuation of accident savings at whatever valuation is currently adopted internally in the country. The implicit judgement is then clearly that of the country, and not of the Bank. Increasingly, there is a requirement that safety audits are performed on project designs which may have the effect of internalizing the costs of avoiding accidents within project costs, without any parallel inclusion of safety improvements in project benefits, hence understating the true rate of return.

17. Environmental impacts are somewhat similarly treated. All projects are pre-classified according to whether they have zero, small or large environmental impact. Those with non-zero impacts are required to have environmental impact assessments, and to

contain mitigating measures to counter any adverse effects. This mandatory requirement covers the more obvious, immediate, consequences of projects. It does not, however, deal with more subtle effects, either positive or negative, associated with traffic generation or modal shift effects. While there is no resistance in principle to the inclusion of such environmental effects within the central economic evaluation it is rarely done, except in cases which are primarily viewed as environmental projects. This partly reflects the absence of adequate data on the physical impacts of specific interventions, as well as the absence of evaluation conventions. Where the environmental impacts are seen to be crucial, as for example in the appraisal of a metro project in Sao Paulo, the impacts are evaluated in monetary terms and included in the central appraisal.

18. Despite the standard Arrow and Lind prescription that public sector investments should be appraised on the basis of an assumption of risk neutrality, the Bank does require an analysis of risk within all project appraisals. This is primarily embodied in the logical framework, described above. But there is also a requirement to address risk in the economic evaluation. In many cases this takes the relatively trivial form of showing the sensitivity of the rate of return to a number of separate eventualities (changes in assumptions about cost, construction period, traffic growth rate, etc), and of demonstrating the switching point with respect to these variables, either singly or cumulatively. More recently, however, it has become increasingly common to employ Monte Carlo simulation methods to estimate a distribution of rates of return based on what are considered to be reasonable assumptions about the range and distribution of specific risks. The appraisal process requires evidence of the actions taken within the project design to mitigate major risks. Quite commonly, those that are the most significant, and most difficult to mitigate, concern institutional failures. Institutional components are therefore commonly included in investment projects.

19. An examination of the fiscal impact of projects is a standard requirement of Bank appraisals. The main purpose of this is to ensure that the impacts of projects on country budgets is sustainable, and that the progress of projects will not be delayed by the failure of countries to provide the domestic counterpart funding called for by the project. In principle, this should also be the basis on which one can take some comfort on the availability of the necessary funding for maintenance of infrastructure. By its nature, however, the analysis of fiscal impacts tends to deal with first order effects only, and also does not to take into account the fiscal impacts of any growth generated by projects.

Some problem issues

20. Structural effects of major inter-urban projects are a major problem. Particularly where major international flows of traffic are concerned (for example in recent trade facilitation projects in Southern Europe) or where significant new inter-regional connections are being developed (for example in the case of the Jamuna Bridge in Bangladesh) this will require some heroic, and generally untested assumptions about the effect of new infrastructure on trade flows. In a recent evaluation of a port investment in Poland the relative costs of routes not even within the country was

critical, and the appraisal had to be based on some very ad hoc estimation of the costs and flows on alternative routes though different Baltic ports.

21. Longer term structural change may also be critical in decisions concerning investments in major urban rail projects. The ex post evidence of the study of many metros suggests that the relief of road congestion and environmental impacts of road traffic, on which such projects are often postulated, rarely occurs. But there is evidence that the major long term effect of urban mass transit systems is to permit the maintenance of a higher level of activity in the central city than could be achieved with a entirely road based transport system. The logic of this is that such projects should be seen as parts of an integrated urban development strategy, with the primary benefits emerging in terms of the lower level of overall public infrastructure costs associated with higher central activity density. A[3] conservative estimation would therefore tend to concentrate on traditionally measured benefits to rail users, and Bank evaluation of urban rail projects have typically wanted to see satisfactory returns measured on this basis as a hedge against risk. More recent Bank investments in urban rail projects in Brazil have mostly been justified on the benefits of transfer of traffic from buses, with significant passenger benefits, but relatively small external congestion benefits assumed.

22. Projects are usually evaluated on the assumption that proper maintenance of new infrastructure will be assured. Attention is thus typically given to consideration of the institutional arrangements for financing maintenance. In the road sector this has led the Bank to support the establishment of user managed Road Authorities to administer National Road Funds. In the rail sector this has led to an emphasis on concessioning service provision to the private sector. For urban transport in some countries it has led to the creation of multi-jurisdictional and multi-functional co-ordination mechanisms. The cost of appropriately scheduled maintenance is included within the project appraisal. In the case of investments in national road rehabilitation or construction it is common for HDM to be used both to identify and to cost the optimal maintenance program, and for that optimized maintenance plan to be assumed. The latest version, HDM-4, has several new features, such as the capability of evaluating more types of vehicles, including NMT and motorcycle, and the capability of evaluating rigid pavement. In the case of other modes the treatment of maintenance is more ad hoc. In all cases, failures to undertake the optimized maintenance schedules would increase total system costs in the long run. Whether this causes under or overstatement of the true return on the project depends on the balance of impact of under-maintenance on the forecast costs of operation with and without the project investment.

23. The economic evaluation literature is replete with consideration of the importance of having correct prices for infrastructure use as the basis for evaluation of investments in increasing infrastructure capacity. In practice, however, there is rarely much consideration given to the relationship between prices and rates of return, often on the implicit principle that significant changes in price structures are political infeasible,

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[3] Mitric, S. "Approaching metros as development projects" TWU Discussion Paper 29. Transport, Water and Urban Development Department, The World Bank. 1998

so that it is unrealistic to insist on evaluations being based on optimum prices. Two things appear to be causing that to be rethought. First, private participation in infrastructure makes the capability of generating revenues more critical. Second, the intractability of urban congestion to non-price instruments is becoming more apparent. Given those trends it is perhaps now time to dust off and represent the theoretical considerations on optimal price and returns on investment in a currently practical form.

24. Private participation in infrastructure finance is, of course, of great current political interest. Many governments still are grossly over-optimistic about the extent to which they can obtain the infrastructure development that they would like off-budget simply by opening the sector to unsolicited private proposals. Initial experience has demonstrated the enormous difficulty of internalizing a sufficiently large proportion of the benefits of economically viable road or urban rail infrastructure to make pure private developments commercially viable. Of course that does not make private sector participation undesirable. But it does raise a new set of questions about the identification and evaluation of public sector contribution to PPP schemes, concentrating particularly on the need to evaluate the external or off-route benefits which cannot be appropriated by the private project investor, and relating the acceptable amount of public contribution to the magnitude of those benefits.

25. The international distribution of benefits is not normally a problem because international traffic is dominated by national traffic. But there are some types of project, particularly port projects and trade facilitation facility projects for which this becomes more central. For example, in a recent port project in Szeczin, Poland, a large proportion of the traffics concerned neither originated nor terminated in the national territory. Benefits to Poland would thus depend crucially on the existence of economic pricing of infrastructure services, and on the extent to which ancillary activities would be stimulated in the vicinity of the project.

26. Similar complexities arise in a set of six trade facilitation projects in South Eastern Europe. The program is designed in the context of a fairly efficient transport market (there is nothing to preclude a Greek or an Hungarian truck company operating in the region) and the industries/manpower in all these countries are under utilized. European market competition may drastically transform the overall outlook as these industries become integrated in a larger market as subcontractors. Competitive forces will decide who will reap the benefits among the countries. The Bank approach has consisted in seeking the best estimate of the gains that were made possible by the project and to monitor the effective impact of the project on road transport operations and on cost of transport. That may not be too unreasonable, assuming that if one country does not participate, it is likely that this country will fall behind much further than it would have by participating, since its competitors would have become integrated. But the question of whose benefit is in question, and how the initial incidence and ultimate impact relate is still rather poorly understood.

27. Low volume rural roads, and particularly feeder paths and tracks programs, have created some particular problems. First, where initial traffic volumes are very low, there are more than normally difficult problems of traffic estimation. Second,

because much of the movement is non-vehicular, there are problems of evaluation of benefits to non-motorized transport (NMT), despite some recent efforts to address this in the context of the Sub-Saharan Africa Transport Program. Third, the infra marginal nature of the impact on basic access to some activities – for example, school and clinic attendance, which become possible with the project and were impossible without– means that they seem to be less convincingly proxied by measured transport benefits than in the case of the more marginal economic activity changes stimulated by improvements in existing networks. Fourth, the costs of detailed appraisal of individual small projects tends to make less sense than that of projects for which the project appraisal costs are a smaller proportion of project costs. For all these reasons, the Bank has tended to rely on appraisal of programs rather than projects, and to concentrate on cost effectiveness of design of specific interventions rather than full cost benefit in these circumstances.[4]

28. A further set of issues associated most closely associated with rural programs relate to poverty impacts. If one of the intentions is to choose ":pro-poor" investments, then the traditional reliance on "willingness to pay" as the source of the valuation conventions seems to be logically less supportable. While there have been some attempts to use inversely income related weighting of benefits[5] these are not yet mainstreamed. More common is an emphasis on local participation in selection and design of activities, through which it is believed that both better initial selection and greater community commitment to maintain the improved infrastructure will be achieved. Certainly this is a way of overcoming the problems associated with roads being constructed by a non-local authority without any clear allocation or funding for subsequent maintenance. It must be recognized, however, that this very pragmatic approach sits uneasily with traditional cost-benefit evaluation procedures.

29. In fact, the Bank's work on local participation in the feeder road area, while driven by the perceived benefits of local ownership and decision-making, have focused primarily on building applicable tools for local communities and local governments to plan and undertake their own (simplified) analysis and planning process. Most of these analytical tools are typically based on one of the following approaches: (i) the application of simplified or modified versions of economic decision analysis (i.e., the RED model or pilot cost-benefit analysis); (ii) a locally adapted (calibrated) version of multi-criteria analysis--usually based on some combination of observables (e.g., traffic, social trips, and economic activity) and chosen social weights (typically related to population within the projects "area of influence"), or simply by undertaking an implicit weighting of investment benefits (e.g., using time-based weights such as in the Integrated Rural Accessibility Planning approach, (IRAP)); or (iii) a form of cost-effectiveness analysis--as in the basic access approach which used $ per population served as a indicator of the relative value of competing investments. The motivation for the development of these planning tools is to introduce some form of rational decision making into a local planning process--loosely, at least, related to principles of economic analysis and the desire for social/human development. In the

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[4] Gannon, C. and Lebo, J. 1999. "Design and Evaluation of Very Low-Volume Rural Roads in Developing Countries." in *Transportation Research Record*, No.1652.

[5] D.de Walle "Choosing Pro-Poor Rural Road Investments" mimeo. April 2000.

end, one might argue, the introduction of these tools has mostly been a sideways attempt to ensure that the Banks investment programs are productive against given development objectives--rather than ensuring ownership or local decision making.

30. Distributional impacts of projects are coming under increasing scrutiny as the Bank – and many other international agencies – focus more specifically on poverty alleviation. In addition to the experiments with benefit weighting, mentioned above, there have recently been some attempts to devise more systematic analyses of the distributional impacts of urban projects. For example, in an urban rail rehabilitation project in Fortaleza, Brazil, which included some restructuring of bus routes to act as feeders to the rail system and the introduction of multi-modal transferable ticketing arrangements, the impact of the project on travel times and trip costs has been disaggregated very finely by zones with different average income levels. As the zones are small and relatively homogeneous this allows the distributional effects of projects to be much more clearly observed**.**

Conclusion

31. In summary, the nature of the objectives of the Bank, and its relationship with its clients, means that the economic evaluation of transport projects performs a rather different role than it does in a typical national administration. It is not concerned with strict ranking of all projects within the Bank portfolio, either within or across sectors, but rather with establishing that individual investments represent sensible use of resources within the context of the national economies to which they are devoted. This results in rather less attention to the consistency of evaluation conventions across Bank projects, and more to the consistency of the evaluation with that of other uses of resources in the target country and to the establishment or assurance of an appropriate institutional and policy framework for project investments.