IMF Working Paper

A Framework for Efficient Government

Investment

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Abstract

This paper argues that governments can achieve more with given amounts of spending or economize on spending without losing effectiveness by modifying the conceptual framework guiding state expenditures. The familiar framework says that state intervention is justified when the spending provides public goods or when the intervention addresses externalities, provided the social return is above a threshold. This paper argues that another consideration needs to be brought into the mix - whether, in spite of the externalities, the private sector has an incentive to undertake the activity. It is argued that these two considerations together define a more efficient framework under which to justify state intervention. According to this modified framework, even a benign state interested in social welfare would not in fact address every externality nor necessarily select expenditures with the highest social returns. These points are summarized in a graph which is then used to analyze policy rules, subsidies and effective interaction between the state and the private sector. It is hoped that this paper points to the kind of information that needs to be collected and acted upon so that states may achieve their goals more effectively.

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1 Introduction

Efficiency in Government is always desirable, but the stakes have been raised by recent events, ranging from the global economic slump of 2008-2012 and associated fiscal retrenchment in Europe and the United States, to renewed efforts to boost spending and borrowing in the developing world to promote development. This paper revisits the conceptual framework that is used to guide government investments towards efficient outcomes. Since Pigou (1920) economists have known that deviations between social returns and private returns potentially justifies state intervention. In addition, social choice theory has led many to regard government failure as the primary argument against state intervention. The point of this paper is that there is more to this issue: even if governments do not fail, and even if there is a genuine and large deviation between private and social returns, government provision or subsidization may still not achieve its aims effectively. This is not because there are some other hidden inefficiencies or general equilibrium effects from government action, but for two different reasons: one is that private returns may still be high enough to guarantee private provision and the other because all returns, private and social, may be too low to justify any investment. Governments that do not take these issues into account are likely to waste money.

The points in this paper are best applied to situations where the state is choosing large discrete investments or expenditures to promote economic growth, development, or more generally to raise welfare. In fact, to bring out the points in sharp relief, the paper assumes that all investments are all-or-nothing expenditures, with no adjustments possible in the size of the investments. The points are applicable to national governments choosing public investment policy and international aid organizations selecting from a wide range of investment proposals. Such organizations require policy rules, investment criteria, and guidance for staff to assist in the selection of investments that at minimum do not waste money and ideally maximize economic impact.

The commonly-used guidance on selecting public investments is summarized in a recent paper by the Fiscal Affairs Department of the International Monetary Fund, in consultation with the Inter-American Development Bank and the World Bank (IMF, 2005). The recommendation is to prioritize projects according to their social rates of return. For example, after reviewing two previously-used approaches, the paper suggests that:

> A preferable approach, detailed in what follows, would en-

tail an assessment of the scope for mobilizing both private and public resources for infrastructure spending, within a macroeconomically sound and fiscally sustainable framework. This assessment should be followed by technically sound steps to identify the projects which, in view of their economic and social rates of return, should have priority within the overall envelope of public investment spending defined in such assessment. (p. 17)

And further:

A first step in evaluating potential public investment projects is to determine whether they are worthwhile on the basis of standard cost-benefit criteria. This involves assessing economic and social returns to the project. The extent to which the government can capture the economic returns—directly through user charges or indirectly through higher taxes—then has to be assessed. Finally, the net (economic or social) returns should exceed the government's marginal cost of borrowing. (p.24)

The issue is left at this point without further discussion. Further guidance is available in Operational Policy 10.04 of the World Bank on economic evaluation of investment operations, which states that: "To be acceptable on economic grounds, a project must meet two conditions: (a) the expected present value of the project's net benefits must not be negative; and (b) the expected present value of the project's net benefits must be higher than or equal to the expected net present value of mutually exclusive project alternatives."[10] The issue becomes what is included under "mutually exclusive project alternatives". Is it only other public sector projects or is it no public sector project at all and letting the private sector invest in the project? The closest the document comes to clarifying this issue is that: "The project is also compared with the alternative of not doing it at all", but the idea that in that case some other entity would do the investment is not discussed.

In practice the issue of the incentives of the private sector is rarely confronted explicitly in project evaluation. The World Bank has financed numerous loans for operations that could in theory be private sector investments (Devarajan, Squire and Suthiwart-Narueput, 1997). In practice project documents typically analyze only the project at hand. There is rarely any analysis of alternatives to the project in the public sector, let

alone the alternative of private sector investment.[11] Justification for public sector investments, if provided at all, usually consists in citing a possible externality.[11] All of this suggests that the issue requires more explicit treatment. Without considering the private sector's incentives correctly, state investments are likely to waste money.

The framework in this paper also serves to suggest what kind of information would be required to promote efficient state investments. This is not to suggest that it is cost-effective to collect all the information, nor that full information with no uncertainty is ever feasible. But the list of useful information would include an analysis of whether there are genuine market failures or externalities, and whether or under what conditions the private sector would undertake the investment. Related to this would be estimation of the private and social rates of return or net present values. This may be contrasted with what is typically collected. Experimental impact evaluations of public sector investments have become increasingly used, especially associated with development assistance, but currently are applied only to a small fraction of public sector expenditures.[7] These provide highly useful evidence, but even if experimental evidence were to become widely used, it would provide only part of the information required for a complete net present value assessment. The more traditional net present value calculation, or economic rate of return calculation, is estimated for less than half of public sector investments even at an institution such as the World Bank, regarded by many as the global leader in this practice. Furthermore, a major reason for this is failure to finance collection of data, rather than insurmountable difficulties in doing the calculation.[11] Many claim that it is impossible to estimate public returns perfectly, but that is not the relevant issue. If the points above are correct, there is scope for improving practice long before governments confront the limits to what is feasible.

This paper is related to previous research. One helpful precursor is Devarajan, Squire and Suthiwart-Narueput (1997) who stressed that the public sector rationale has been a critical missing ingredient in project analysis, and endorsed a shift in emphasis of project evaluation towards the public sector rationale away from rate of return considerations. There are also efforts to improve the quality of public investments with benchmarking exercises. Dabla-Norris, Brumby, Kyobe, Papageorgiou, and Mills (2011) develop a quantitative index of the quality of public investment across countries. Furthermore, improvements in public investment efficiency, apart from their obvious and direct benefits, may also serve to relax borrowing constraints for low-income countries, as they are a critical variable determining sustainable levels of borrowing (see for example Buffie, Berg, Pattillo, Portillo, and

Zanna (2012)).

To communicate the important points in the simplest manner, the paper begins with a graph to introduce, analyze and summarize many of the issues (section 2). The diagram is designed to illustrate efficiently a variety of issues with investments, from the public good dimension to externalities of varying degrees, both positive and negative. It also shows how private sector incentives might interact with these to affect policy decisions. This framework is then used to analyze decision rules for public investments (section 3), the conditions under which externalities justify public intervention (section 4), how and whether the state could efficiently support the private sector (section 5), and when subsidies may be justified (section 6). The paper then considers evidence on the extent to which current government policies and practice reflect considerations outlined here (section 7). Section 8 offers conclusions.

2 A graph of Possible Investments

Many of the arguments of the paper can be illustrated in a single graph. Figure 1 shows the space of all investments (or projects). The private rate of return is measured on the vertical axis and the social rate of return is measured on the horizontal axis. For convenience, negative return investments are not shown. Projects with no externalities, for which private and social returns coincide, fall on the 45 degree line. Projects with positive
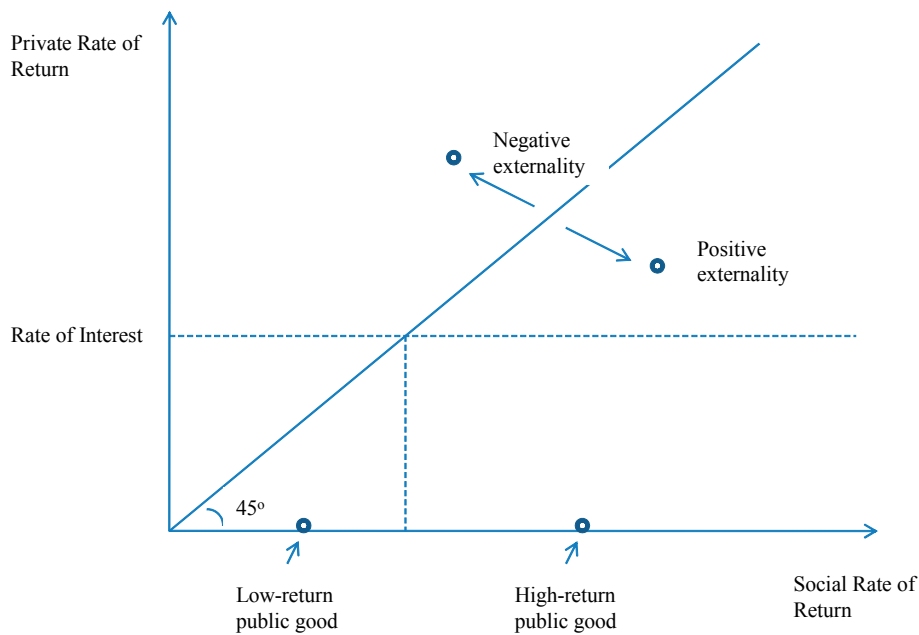

Figure 1: Illustration of Private and Social Rates of Return for Investments

externalities lie to the southeast of this line, where social returns exceed private returns. Projects with negative externalities lie to the northwest, where private returns exceed social returns. Because society includes the private sector, the social return is the sum of the return as perceived by the private sector and a positive or negative externality adjustment. Pure public goods are shown as cases where private returns are zero but social returns are positive. These are illustrated by points on the horizontal axis. The diagram could be drawn with risk-adjusted returns on the axes, so the framework is capable of dealing with some risk-related issues.

Setting aside risk, or regarding Figure 1 as measuring risk-adjusted re-

turns, rational investors in the private sector would adopt all investments for which the private rate of return exceeds the rate of interest. In terms of Figure 2, this means that the private sector will invest in projects B, C, and F, all of which have returns that exceed the rate of interest.
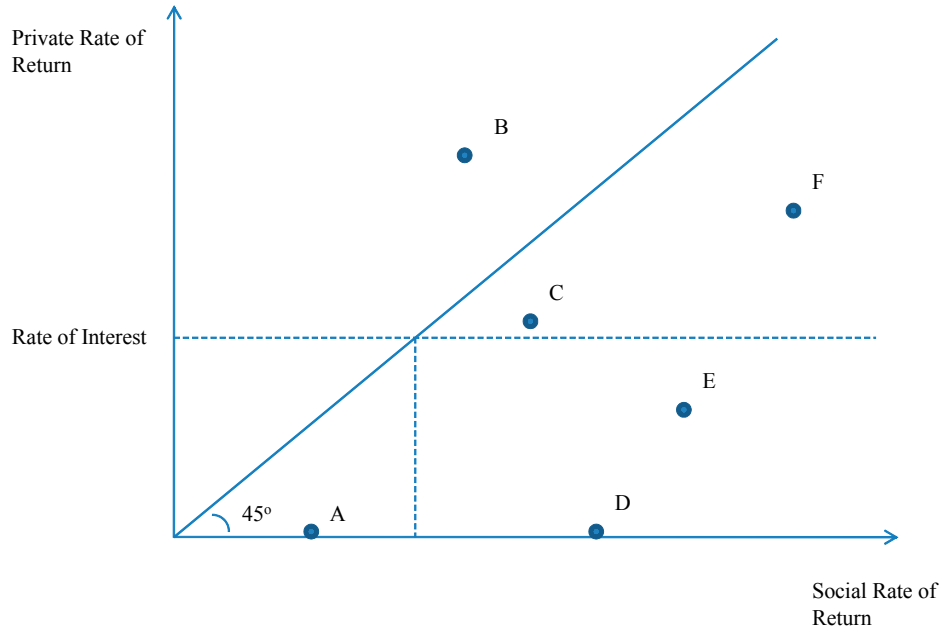
Private Rate of Return

Rate of Interest

45º   A

B

F

C

E

D

Social Rate of Return

Figure 2: Six Possible Investments - which should the Public Sector do?

3   Decision Rules for State Investments

Consider now several possible decision rules to guide the selection of public-sector investments. One such rule would be to select projects with the highest social return, i.e. rank projects from high to low in terms of social returns and select from the top of the list down[1]. In terms of the diagram, this would entail selecting project F, then E, then D and so forth. Because

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[1] As an example of official policy guidance that is sometimes interpreted this way (stated using net present value as the metric rather than the internal rate of return) the World Bank's Operational Policy 10.04 states: "To be acceptable on economic grounds, a project must meet two conditions: (a) the expected present value of the project's net benefits must not be negative; and (b) the expected present value of the project's net benefits must be higher than or equal to the expected net present value of mutually exclusive project

the private sector would invest in project F on its own, this rule is problematic. The correctly-measured impact of government investment in project F is zero, because the private sector would have invested without public investment. The government would have simply replaced what the private sector would have accomplished[2].

A second rule would be to rank projects according to the difference between the social return and the private return and select projects with the highest gap. The gap between the social and private returns is measured as the vertical distance between the 45 degree line and the dot representing the investment: hence investments below the line would have a positive gap and investments above the line would have a negative gap. However, this would not be optimal because this rule offers no safeguards against an investment such as F being chosen. A final rule is for the public sector to confine itself to the provision of pure public goods. Such investments are represented by points along the horizontal axis; but this would not guarantee the best outcome because there may be investments that have higher social returns than pure public goods, such as investment E.

What then is the welfare-maximizing decision rule for public sector investments? The figures serve to emphasize that the issue cannot be decided solely by looking at either social or private returns alone. There are two different errors to be avoided: that of selecting high-return projects in which the private sector would invest; and that of selecting low social-return projects. Moreover, the public sector operates with a budget constraint that confines its choices. Given this budget constraint, which is not illustrated in the figure, governments should select only from investments that fall in the bottom right rectangle, and select investments according to their social return until the budget is exhausted. Further refinements to this rule would have to take into account the policy tools available to the public sector and their administrative costs. The tools available to the public sector range from direct provision or operation by the public sector to sub-contracting, partnering and tax and subsidy policy. For example, it may prove to be cost-effective for the public sector to invest in D with no private partnership but to subsidize E until its privately-perceived return just exceeds the rate of interest (crossed the line above) so that the private sector would voluntarily invest. In terms of Figure 2, if the public sector could only afford to invest

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alternatives." If the net present value is calculated with the proper counterfactual, it does not run into the pitfalls discussed here, but in practice this is frequently overlooked. See http://go.worldbank.org/HEENE0JRS0

[2]It is taken as given in this paper that it is never optimal for the state to perform an investment that the private sector would do voluntarily.

in two projects then the optimal policy would be to select D and E, not E and F. Such a policy would ensure investment in all the socially beneficial projects B, C, D, E and F.
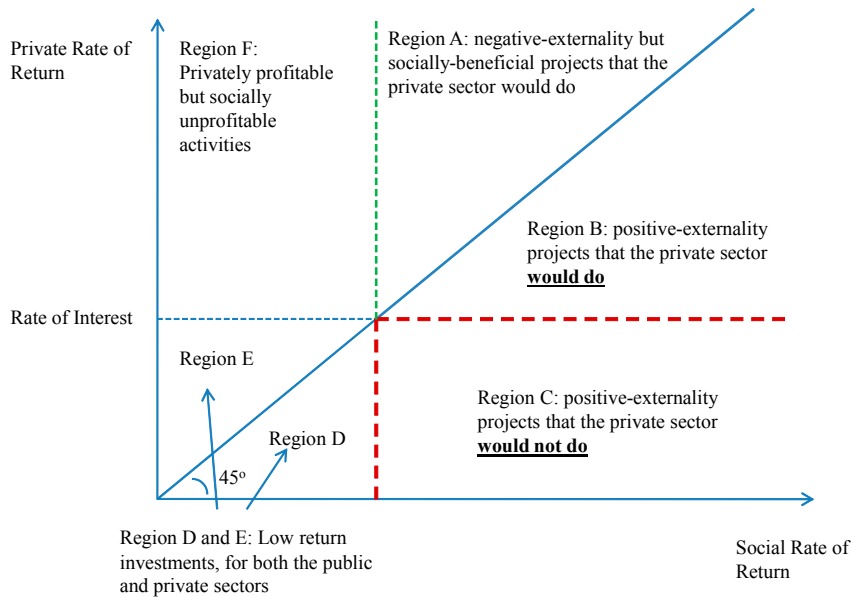

Figure 3: State Investments Should Focus on Region C

In summary, the region of maximum impact for public investments is region C illustrated in Figure 3. Investments in this region have a positive social rate of return and would not be conducted by the private sector. In contrast, government investments in projects in regions A and B would not be additional: such investments would appear to have an impact but would in fact have no true impact despite the appearance. And investments in projects in regions E and D would waste funds relative to those in region C.

4   Do Externalities Always Justify Intervention?

Externalities are commonly used to justify public sector interventions, but does the existence of an externality provide a necessary or sufficient condition for public intervention? Do externalities always justify intervention or only some of the time? If only some of the time, what are the conditions? An

externality exists whenever there is a wedge between the private returns and social returns to an activity - in terms of the diagram, all investments not on the 45 degree line entail some form of externality. The first chapter of the Handbook of Public Economics, reviewing Pigou's (1920) contribution, puts the issue as follows:

> Where social benefits are in excess of private, a bounty needs to be paid to allow for the additional (external) benefits which are not reflected in market demand. Where social costs exceed private costs, a tax is in order.[2]

Paul Samuelson put the issue as follows:

> Myriad "generalized external economy and diseconomy" situations, where private pecuniary interest can be expected to deviate from social interests, provide obvious needs for government activity.[9]

Although neither quote stresses the issue by using terms such as "always", as in "..a bounty *always* needs to be paid.." or "..*always* provide obvious needs for government action..", both passages could be read as having that meaning. It is probably fair to say that many have read these passages as having an unconditional meaning. Moreover, neither source goes on to discuss cases where externalities would not justify intervention. Figure 3 illustrates that the presence of an externality is not sufficient to establish that public-sector provision would be welfare improving, and for reasons that have nothing to do with government failures. Any investment not on the 45 degree line entails an externality, but there are many investments "off the line" for which public provision would nevertheless be inefficient.

Investments by the private sector that are innovative may lie in region B. If some part of the value of the innovation is copied and captured by others, the original inventors will not fully capture the social return of their innovations. But the innovations may still be sufficiently profitable that the private sector will invest despite this externality. Investments in this region are such that both the private inventor and society at large benefit. Society does happen to benefit more that the private investor, but the extra return comes as a free benefit. This is a case of a positive externality but not necessarily a market failure. A market failure exists when the outcome of the market is not Pareto efficient; but in this case, if the investment still

occurred one cannot conclude that the market failed. There would be a market failure however if the private market produced less than was socially optimal - a case which is difficult to illustrate in the diagram.

Nor is it correct that negative externalities necessarily justify government action. Investments in region A entail a negative externality but still have a positive social return. Much depends on the size of the externality: if the negative externality were sufficiently large that the investment entails a negative social return (region F), then the case for public involvement is stronger. Negative externalities alone do not necessarily justify intervention.

There are also investments which satisfy the criteria that the social value exceeds the private value, that would not be invested by private sector, and yet still would be poor candidates for public investment. These would be investments in region D of Figure 3, below the 45 degree line. For projects in this triangle, even though the social return exceeds the private return, the social return is simply too low to justify public provision. This case illustrates once again that the mere presence of an externality is not sufficient to justify public sector investment.

5   How to Efficiently Support the Private Sector

Sovereign Investment Funds, Government Agencies, and sections within international financial institutions such as the World Bank's Finance and Private Sector Development Group and the International Finance Corporation make investments with the avowed mission of promoting private sector development. In terms of the diagram, many of the projects of such agencies are financing or participating as co-financiers in private sector investments in regions A, B, or F. Does this imply necessarily that such investments have no impact? This section illustrates how to use the diagram to help in the analysis.

A simple example is where a Public Agency (PA) finances a cement company. For the sake of argument imagine that the company borrows from the PA to invest in new technology that raises its productivity. If the firm is a significant player in the industry, the shift in supply from the additional output would affect market supply and lower the market price of cement. Standard welfare analysis would say that domestic consumers would benefit from the lower price, the four incumbent firms would loose, the investing firm would gain and overall welfare would increase. Distributional consequences could add or subtract from this conclusion. If the incumbent firms were acting as a cartel, and the PA-financed investment reduced the market power

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of that cartel, and consumers were relatively poorer, then the distributional consequences would be positive.

The points so far establish only that this investment could be to the right or the left of the 45 degree line: how far to the right or the left depends on several unknowns (we can stipulate that the private rate of return on this investment lies above the interest rate, otherwise the firm would not voluntarily borrow from the PA). What is crucial for determining the net contribution to society is whether another Bank would have financed the investment, and on what terms. If another Bank would have financed the investment on the same terms, the PA's net contribution would be zero, in spite of any additional social consequences of the investment.

Therefore the existence of positive social consequences of private investments is not sufficient to establish that the PA's involvement has made a positive net contribution to society. To determine any net contribution it is necessary to understand attributes that the PA would bring to the investment that normal Banks would not.

One possibility is that the PA has greater business expertise and experience than private Banks. This is an argument that is sometimes made in countries or regions with undeveloped financial markets. If this were the case and the expertise translated into higher business success of the investment, then, as illustrated in Figure 4, the effect would be to shift an investment's returns from position F to position Y or Z.

If the benefits of the PA's involvement redounded to the enterprise alone, with no additional social consequences, then the PA's involvement would shift the returns from position F to position Z, along the 45 degree line from position F. Note that it is not the case that the investment would shift to position Y, with no positive social value, because the benefit to the firm has some social value (the firm is part of society). The social impact of the PA's involvement would equal the horizontal distance between position F to position Z. In summary, the PA's contribution would not be represented by the entire social return of the investment at position Z but rather the short horizontal distance between F and Z.

A second possible impact would occur if the PA's helps structure investments to have greater social benefits for given levels of private returns. In Figure 4 this corresponds to a shift from point F to point X. The social contribution would be measured by the horizontal distance between these two points. If the restructuring provided some private benefit in addition, this would be represented by a point somewhere to the north of X.

A third way in which the PA could influence welfare would be through demonstration projects. A demonstration project is a project undertaken
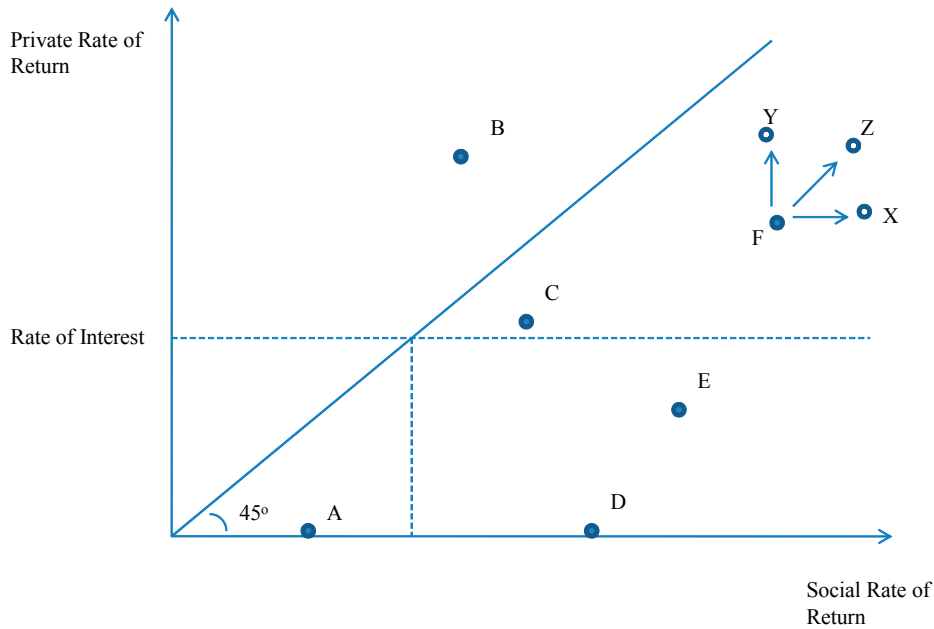
Figure 4: Possible Contribution of Government Investment in Private Sector Projects

for the purpose of showing others that it is beneficial. The justification for a demonstration project rests on the hypothesis that the demonstrator knows something about the commercial viability that is not sufficiently appreciated and needs to be proven. In this case the demonstrator would be the PA. The case to consider is where there are a class of investments that are falsely believed to be unprofitable, so that they are thought by the private sector to lie below the interest rate line, illustrated by the solid circles in Figure 5. Suppose that in fact those investments would be commercially viable if attempted, illustrated by the circles just above them. If the PA were to subsidize or offer financing on concessionary terms to investment "A1", to induce a private partner to invest, and other potential investors saw the profitability of the investment and voluntarily chose to invest in other similar projects, then the PA would have caused investments to occur that would not have occurred without its intervention. The social value would be the social return of the additional investments minus the cost of the subsidy. Note that demonstration projects are more likely to have a positive impact the
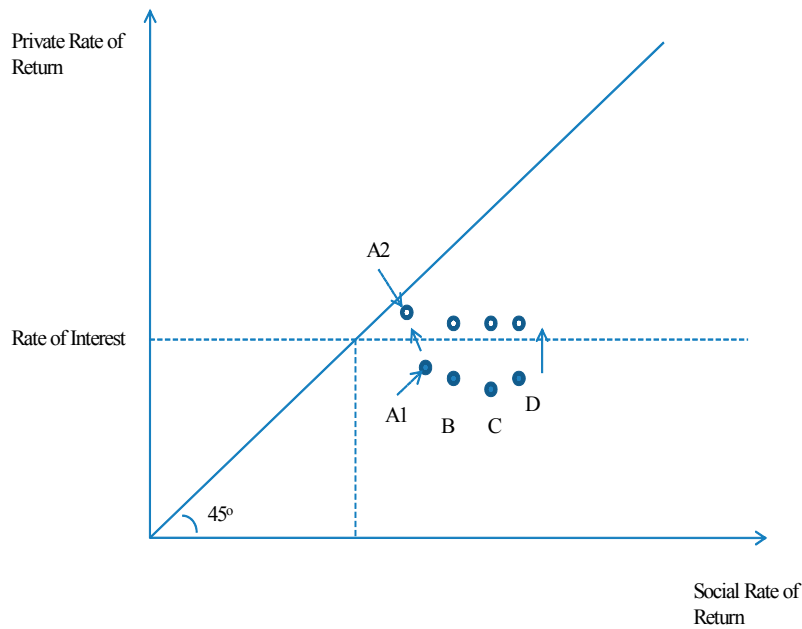
Figure 5: Possible Contribution of Demonstration Projects

more additional projects are involved, the higher the social return relative to the private return of the group of projects, and the less costly the subsidy.

6 Subsidies

Without endorsing subsidies, the framework can be used to analyze conditions under which subsidies can be justified, and to illustrate critical issues. There are two issues to bear in mind with subsidies: a subsidy from the government raises the rate of return to an investment as perceived by the private sector, and it potentially incurs efficiency costs for the economy because of distortions and the fiscal cost –the need to raise revenues and incur further distortions. In terms of the diagram, the subsidy creates a gap between the return as perceived by the private sector investor and the true return. But the requirement to raise money for the subsidy causes further costs and also shifts the true return to the left. Overall, there are four points to consider: the pre-subsidy rate of return from the perspective of the private sector and society, and the post-subsidy rate of return from the perspective of the

private sector and society. In Figure 6, point A1 would be an example of an investment which, before the subsidy, did not have an attractive rate of return for either the private or public sectors. After the subsidy, the private
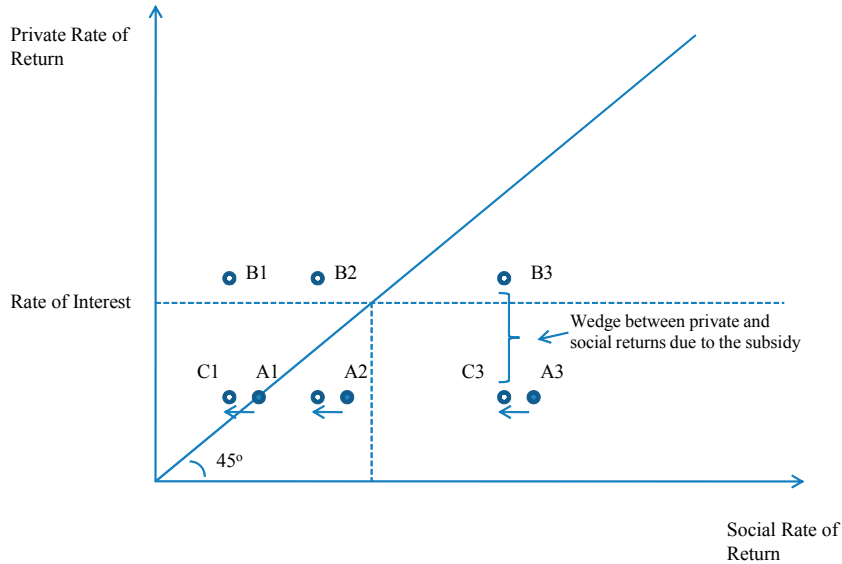

Figure 6: Potential Justification for Subsidies

return would be augmented by the subsidy, perhaps to a point corresponding to B1, where it now has an attractive rate of return. From the perspective of society however, the subsidy does not transform the original investment, which remains unattractive. It does potentially introduce distortions and dead-weight loss, and these extra costs to society means that the social return on the subsidy-laden investment would fall somewhat to the left of the social return of the pre-subsidy investment, as illustrated by the circle C1 to the left of A1. Hence, after the subsidy, the private sector would perceive the returns at B1 but the social value of the investment would correspond to the point C1. Note that part of the subsidy represents a transfer, from current or future taxpayers to the beneficiaries of the firm, and to the extent that there is no net distributional benefit from this transfer, this part of the subsidy nets out to zero and does not augment the returns for society (if we counted only the benefit to the firm and ignored the taxpayer liability, we

would be led to measure the subsidy as a movement to the northeast in the diagram).

What is clear from the diagram is that if the return profile of the original investment was represented by point A1, then a subsidy would not be socially justifiable, because the social return on the subsidized investment would be C1. Moreover, even if the investment originally entailed positive externalities, a subsidy may still not be socially justifiable, as illustrated by the investment at point A2, which is a low-return investment despite the positive externalities. Only in the case of investments represented by point A3 would subsidies raise welfare. Because of the distortions caused by subsidies, the diagram serves to emphasize that subsidies are best reserved for investments with very high social return relative to private returns, and private returns below the rate of interest.

It is frequently stated that subsidies are not justified if there are no externalities and the private sector has an accurate view of the returns (i.e. the government has no information advantage over the private sector). Investments on the 45 degree line illustrate this case. This is the easy case however. It is much harder to determine if and when subsidies are justified if either or both of these conditions fail. To take one of the four logical cases, that of positive externalities and no misinformation, a subsidy would only be justified for certain investments in region C (not even all of region C qualifies). This case is illustrated by point A3, where, even after the efficiency cost of a subsidy is taken into account, the subsidy causes an investment to take place that would be socially desirable.

7 Policy Statements

What do governments say on the issues raised in this paper? This section discusses two examples. The first is from the European Commission, which recently proposed a new policy to guide state investments[3]. The policy called for a renewed focus of expenditures on genuine market failures:

> If a public expenditure does not address a genuine market failure, it will be ineffective; which means that taxpayers' money is wasted and markets are distorted. Instead, government support should go where it can make a difference for EU competi-

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[3]See for example the new policy to modernize State aid policy from the Vice President of the European Commission responsible for Competition Policy, February 2012 (J. Almunia speech available at http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/12/59

tiveness and where it can stimulate innovation, growth and employment.

This statement begs further elaboration. If market failures and externalities are taken as equivalent, the first statement is consistent with the framework presented here, as there is no clear justification for public sector provision of investments that lie on the 45 degree line. If however the statement is taken to imply there is justification for state provision for investments that lie off the line, then it is an incomplete guiding principle. As discussed, addressing externalities is necessary but not sufficient to avoid wasting public funds. All investments that do not lie on the 45 degree line in Figure 3 entail an externality in the sense that the social return deviates from the private return. Yet investments in region B are a waste of public funds because they would be performed by the private sector, and investments in region D and E are a waste of public funds because the social return is low.

A second example comes from the Australian government, which endorses the idea of gap filling, in which the public sector restricts itself to investments that the private sector would not perform. In December 2011, the government published a draft Energy White Paper for public consultation. The paper endorsed the idea, contained in principle number six to address identified market gaps[4].

Government energy policy interventions should be transparent, cost-effective, justifiable against objectives and targeted to address identified market gaps or failures.[1]

If market gaps are understood to refer to any investment that the private sector would not do, then this is also a necessary but not sufficient for efficient public investments. It is not sufficient because it includes regions D and E, for which the social return is too low to warrant public investment. The statement begs further elaboration, as the right investments cannot be decided solely by the gap-filling principle.

Many institutions appeal to the idea that their expenditures support the enabling environment. This is a public-good investment which provides the legal and regulatory framework to help the private sector operate efficiently. In the diagram, these could be represented along the x-axis - investments that raise the private returns on many other investments. The impact may also be represented by imagining all investments shifting up, increasing the set of investments that are deemed to be profitable by the private sector.

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[4]See Core Principles, page 7, in Commonwealth of Australia (2011)

8   Concluding Statements

Setting aside the details, the framework in this paper argues that two different kinds of analysis should be combined in order to avoid important mistakes in public sector investments. The first is some analysis of whether the private sector would pursue the investment the absence of government incentives or direct government investment. A simple analysis of externalities or market failures does not get at the critical point because it is possible that private investors would invest despite externalities (if the private return is nevertheless high enough). The second critical piece of information is the social rate of return of the investment. This is important to avoid the second critical error in public investments - that of investing in low or negative return investments.

The paper considers investments in discrete lumpy investment projects, with no scope for adjustments in quantity invested at the margin.   This device was used to bring out an issue in sharp relief: it is possible that the private sector would choose to do such investments, despite any externalities, and provide the socially right amount, with no scope for further welfare-enhancing intervention by the public sector.   Hence externalities do not automatically justify public intervention.   It can make sense for even a well-intentioned government to ignore certain externalities.

It is difficult to precisely establish the extent to this is new wine or old wine in new bottles, but it may not matter, because the practice suggests that some of the points here have been forgotten or maybe were never communicated very well.   The plain language in textbook statements on externalities can be read as implying that all externalities justify public action. They are usually brief, without much clarifying elaboration.   Formal statements to guide investment appraisal are also brief, recommending simple rules such as selection of public investment projects with the highest net present value among mutually exclusive project alternatives, including the alternative of doing nothing at all. If the public sector refrains, the private sector might invest, so this could be analyzed, but there is little encouragement to do so.   At least in the case of World Bank investment guidance, this is not explicitly mandated or discussed. In practice, governments have often invested in or subsidized private sector activities, externalities are often cited to provide unconditional justification for public investments, cost-benefit analysis of public investments tends to analyze one project rather than a range of alternative projects, and analysis of whether the private sector has an incentive to undertake investments is often not done. Therefore, whether or not the points in the paper are novel, they are not widely applied,

and this is consistent with the idea that the issues are not well understood or have been poorly communicated.

In addition to highlighting the kind of information required for determining whether public investments will raise welfare, the graphical framework can be used to clarify what *could* be the positive contribution of efforts by governments to support the private sector, invest in demonstration projects and subsidize private investments. Here the framework serves to clarify what must be demonstrated to justify such investments.

It is often claimed that it is difficult to measure benefits precisely and thus difficult to estimate public and private rates of return. This is correct but is not relevant to the discussion. Let us imagine a scale of 1-10, where 10 stands for an analysis with no uncertainty or measurement error. Assign a 7 to the maximum feasible analysis, that uses the best methods and collects information and data up to the point at which the value of information is just equal to the costs of acquiring the information. Let us say that casual observation and a fair amount of evidence establishes that current practice is represented by a score of 3. The fact that 7 is less than 10 is not an argument for resisting the move from 3 to 7. If the points in this paper are correct, there is scope for improving practice long before governments confront the limits to what is feasible.

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