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The choice of the social discount rate and the opportunity cost of public funds

Abstract: The decades-old literature on the correct method for choosing and estimating a social discount rate (SDR) has resulted in two, largely opposing viewpoints. This note seeks to clarify the key sources of disagreement between these two camps. One view advocates that the choice should be based chiefly on the social opportunity cost of the return to foregone private capital investment (SOC), and suggests a SDR of around 7%. The other viewpoint, expressed by the authors, argues that the choice should be based on the social rate of time preference (STP), the rate at which society is willing to trade present for future consumption, suggesting a SDR of around 3.5%. Because of the fundamentally normative basis of the SDR choice, neither approach generates testable hypotheses that would allow falsification. For government project evaluation, the choice ultimately depends on the opportunity cost of public funds, which in turn depends on how fiscal policy actually operates. The STP approach contends that governments set targets for deficits and public debt, so that a marginal government project will be tax-financed, largely crowding out current consumption. The SOC belief is that governments set revenue targets, so that any government project will be deficit-financed on the margin, which will largely crowd out private investment. The authors also argue that a SDR based on the STP approach is appropriate for: benefit-cost analysis of government regulations, self-financing government projects, and government cost-effectiveness studies.

Keywords: benefit-cost analysis; project evaluation; social discount rate; social opportunity cost of capital; social rate of time preference.

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1 Introduction: The fundamental disagreement

The "Most Appropriate Social Discount Rate" (hereafter MASDR) is a comment on Moore, Boardman, and Vining (2013) (hereafter MBV 2013). The arguments

made in MASDR are largely a repetition of arguments previously found in Burgess and Zerbe (2011) and Burgess (2010, 2013), although MASDR also contains a number of specific points about MBV (2013) which we address later in this response.

To summarize, MASDR argues that the choice of a social discount rate (SDR) should be based on the social opportunity cost of capital (SOC), which largely reflects the average pre-tax return to private capital investment. Using this approach, MASDR advocates a real SDR of approximately 7% for the United States (US).[1] In both MBV (2013) and Moore, Boardman, Vining, Weimer, and Greenberg (2004) we argue that the SDR should be based on the social rate of time preference (STP). The STP is the rate at which society is willing to trade present consumption for future consumption. Using this approach, we suggest a real SDR of approximately 3.5%. The SDR is important because it often determines whether a government project or regulation has a positive net present value and, therefore, whether it passes a benefit-cost analysis test. When choosing a SDR, practitioners are often deciding, explicitly or implicitly, whether to use a rate based on the SOC or a rate based on the STP.

Rather than engage in a repetitive "he said, she said" debate with MASDR (which the editor, very sensibly, will not allow), this paper focuses on explaining the fundamental differences between the two approaches. These differences matter considerably for benefit-cost analysis (BCA) and, where BCA actually influences policy, for government policymaking. Essentially, the key difference depends on how one thinks the government fiscal world works.

These two approaches to determine the SDR have been presented and discussed by many authors over the last 50 years. Unfortunately, neither view generates straightforward falsifiable hypotheses that are amenable to empirical testing. As a result, there has been no neat resolution of the debate. Ultimately, given this reality, the choice of a SDR must reflect one's own view about the opportunity cost of public funds. More specifically, the choice comes down to whether one thinks it is more reasonable to assume that public investment largely crowds out private investment (the MASDR view), or whether it primarily reduces current consumption (the MBV view).[2]

1 However, in MBV (2013, p. 12) we argue that, using recent US data, a superior approach to estimate the SOC would result in a rate of approximately 5%. There is no reason to repeat that analysis here.

2 For simplicity, we maintain the benefit-cost tradition of assuming full employment, although we think it unlikely that there is much crowding out of anything during periods of less-than-full employment. We also ignore the possibility that the public investment will simply crowd out net exports (as in Lind, 1990).

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The approach we advocate is known as the social rate of time preference-shadow price of capital (STP-SPC), or sometimes as the "shadow price algorithm". The Office of Management and Budget (OMB, 1992) calls the STP-SPC "the analytically preferred method". Burgess also acknowledges that the STP-SPC method "seems to have become the criterion of choice among academic economists," recommended by the "major textbooks" (Burgess, 2010, p. 136). The STP approach reflects the fundamental view that the SDR should ideally reflect the values that "society" places on consumption at various points in time. As we have argued elsewhere (Boardman, Moore, and Vining, 2010; MBV, 2013; Moore et al., 2004), the construction of a SDR is a normative exercise, as is all BCA.[3]

There are many theoretical and empirical problems with trying to infer individual rates of time preference using either observed rates of interest or intertemporal choices (which MASDR discusses on pp. 3–4). Given these problems, which are fully explained elsewhere, the STP-SPC approach does not recommend attempting to estimate the STP from market rates. Instead, the STP uses the standard welfare economics assumption that society should act *as if* it is maximizing the utility of consumption by a representative individual. An exercise based on this maxim yields the familiar Ramsey (1928) formula, on which we base our STP estimate.

In a "first best" world of optimum growth (the maximum sustainable rate of per capita consumption), the STP would also equal the pre-tax return on private investment (ROI). However, both the existence of corporate and personal taxes and the empirical evidence imply that the world is "second best": the return on investment (ROI) exceeds the STP, so that the rate of capital accumulation and the resulting growth rate are less than optimal. Hence, a public investment project that sacrifices current consumption and generates a return in excess of the STP will raise social welfare. If the project sacrifices current investment as well as current consumption, then the foregone investment would have yielded future consumption possibilities at the higher ROI rate. To account for this possibility, the STP-SPC approach applies a shadow price of capital (SPC), which is greater than one, to convert any displaced investment into "consumption equivalents" before discounting at the STP.

However, in MBV (2013) and previously, we argue that for many project or policy evaluations shadow pricing will not be necessary. For the analysis of

3 Standard BCA recommends choosing projects that pass the Kaldor-Hicks test of *potential* Pareto improvement. This implies both that the initial distribution of endowments is legitimate and that a policy that produces winners and losers is normatively acceptable, as long as the winners *could* more than compensate the losers and the losers *could not* bribe the winners to forgo the project.

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regulations that primarily affect private consumption (e.g., through higher prices), discounting can simply proceed at the STP.[4] For studies comparing the cost-effectiveness of alternative policies (with similar time-profiles of expenditures), shadow-pricing will not affect the results. For projects that are self-financing (all costs increase government expenditures and all benefits increase government revenues), shadow pricing will not affect the go/no-go decision (although it might affect the ranking of public projects; see Bradford 1975). If public investments are tax-financed on the margin, then we concur with Arrow (1995) and others that income taxes will primarily affect consumption (since most income is spent on consumption) and that other taxes will fall even more heavily on consumption. So, as a first approximation, the main effect of engaging in a government project will be to reduce private consumption, not investment, making shadow pricing largely unnecessary.

In contrast, the SOC approach recommended by MASDR adopts the "convention" that the capital market is the marginal source of funds for all government projects. Marginal public sector borrowing is expected to increase the market rate of interest, and this chiefly reduces private investment.[5] In this view the alternative, or counterfactual, to a given government investment is not more private consumption; rather it is more private investment. Since this investment would have earned a ROI in excess of the STP, then adopting a public project with a rate of return greater than the STP, but less than the ROI, means that society would have been better off to have made the higher-yielding private investment.[6] To avoid this outcome, given that shadow pricing is unlikely to be used in practice, the SOC view advocates a SDR based largely on the ROI. So the choice of the SDR hinges critically on what the actual opportunity cost of the government investment is: foregone private consumption, or foregone private investment.

4 The OMB concurs that BCA of regulations that largely affect consumption should use a SDR based on the STP and recommends an estimate that is based on the real, pre-tax return to long-term government bonds of around 3% (OMB, 2003, Section E). The OMB also advises the use of this rate for BCA studies of cost-effectiveness, lease purchases, asset sales and internal government investments (OMB, 1992). Its default rate recommendation when private investment is primarily displaced is to use 7%, based on the real average ROI in the US, which is a variant of the SOC approach.

5 The increase in the interest rate will also increase saving somewhat, reducing current consumption, and it will appreciate the exchange rate and lower net exports, increasing foreign borrowing. In advocating a SDR of approximately 7%, Burgess and Zerbe (2011) assume that 54% of the project's borrowing is at the expense of private investment, 10% reduces consumption and 36% increases foreign borrowing.

6 Of course, this statement relies on the normative judgments implicit in the Kaldor-Hicks criterion (see footnote 3, *supra*).

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2 The source of funding of government projects

MASDR presents four major arguments against the MBV (2013) view that government projects are largely tax-financed, and thus chiefly reduce consumption.

First, MBV (2013) argues that the assumption that the marginal source of funds is government borrowing rather than taxes reduces to a *reductio ad absurdum*: if every (marginal) project is debt-financed, then all government expenditure would be debt-financed. This is clearly not the case. MASDR claims that MBV (2013) is incorrect because it confuses a marginal source of funding with the average source of funding (MASDR, p. 6). However, it is unclear how each and every marginal project can be debt-financed and yet, on average, government expenditure is (mainly) tax-financed.

Second, MASDR (p. 6) argues that many projects do not require tax funding because they are self-financing. While it is true that some projects are self-financing, discounting should still proceed at the STP. As previously stated, failing to shadow price will not affect whether or not such a project passes a net benefit test (although it might affect the magnitude of the net benefits).

Third, MASDR (pp. 6–7) claim that treating all government investments as being debt-financed is "a convention that allows project evaluation to be separated from tax policy. Rather than a specific project benefiting from, or being disadvantaged by, the use of a specific tax, all projects are evaluated on a level playing field." But ultimately, projects can (and indeed must) be thought of as being funded by general government tax revenues. It is not clear why one would wish to specify a particular tax as the source of funding for any particular project and include its analysis as part of the project evaluation.[7]

Fourth, while appearing to accept the Bradford-Lind-Arrow view (Arrow, 1995; Bradford, 1975; Lind, 1982) that, in a mixed economy, the government does not have the option to invest directly in the private sector, MASDR nevertheless argues that the government always has the option of raising the taxes that would otherwise have funded a specific government project and using those funds to reduce the government debt instead. According to MASDR (pp. 8–9), by reducing government borrowing, interest rates would be reduced and private investment crowded in. There are two problems with this argument.

First, MASDR criticizes the MBV (2013) formula for calculating the SPC because, for simplicity, it assumes a constant marginal propensity to save. MASDR

7 Since actual (as opposed to lump-sum) taxes generally impose deadweight welfare losses, one can simply treat these losses as an extra social cost, in addition to the revenues needed to fund the project, when calculating net benefits.

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appears to prefer the assumption that the private sector has the same information as the public sector and has perfect foresight (so that it takes into account the implications for future taxes of any change in the government's budget). But this (along with perfect capital markets, no liquidity constraints and intergenerational bequests) implies Ricardian equivalence (Barro, 1974). According to this view, a tax increase (decrease) that results in a decrease (increase) in government debt has no effect on interest rates, because the private sector simply changes its life-time consumption plans to take account of the decrease (increase) in future tax liabilities. In other words, a debt-financed government project would simply increase saving and therefore crowd out private consumption, not investment. And raising taxes to pay down the debt would simply reduce saving and hence increase current consumption, not investment. So if Ricardian equivalence holds, then the relevant counterfactual to more government investment is not more private investment, it is more private consumption.

The evidence for Ricardian equivalence for the US is mixed. Bernheim (1987, p. 1) finds "a complete lack of either evidence or coherent theoretical argument to dispute the view that sustained deficits significantly depress capital accumulation in the long run" – i.e., increased government borrowing *does* increase interest rates and so lowers private investment. However, Seater (1993, p. 184) claims that "empirical success and analytical simplicity make Ricardian equivalence an attractive model of government debt's effects on economic activity." Related evidence can be derived from estimates of fiscal multipliers, which attempt to measure the cumulative effect of changes in debt-financed government purchases on aggregate output. Ricardian equivalence implies that these multipliers should be zero (or negative). Multipliers between zero and one imply some crowding out of private investment; multipliers in excess of one would imply crowding in. On this basis, Reitschuler and Cuaresma (2012) reject the null hypothesis of Ricardian equivalence for the US. In a survey of studies of the US fiscal multiplier, Chinn (2012, p. 7) finds estimates ranging from 0.5 to 2.5 and cites other survey work that estimates multipliers ranging from 0.8 to 1.5 or higher.

Even if Ricardian equivalence does *not* hold, the second problem with the MASDR contention that the relevant counterfactual to a tax-financed project is a tax-financed debt reduction is that this is not how the government fiscal world works. The MASDR view appears to be that the government sets an overall target for revenues and then performs project evaluation. On the margin, any new project would then be deficit-financed. In contrast, MBV (2013) argues that the most plausible view is that the government sets an overall target for the government deficit and debt. Project evaluation then occurs against this background. On the margin, any new project will need to be tax-financed. The question is:

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which view of fiscal policy procedure is a better approximation of the underlying reality?[8] We leave it to the reader to decide.

3 Responses to some specific points

MASDR (p. 4) also criticizes MBV's (2013) estimates of the underlying parameters of the STP-based SDR because they are "not using data on the performance of the actual economy." As MBV (2013) clearly states, its estimate of the elasticity of the marginal utility of consumption is based on measures of inequality aversion inferred from social preferences as revealed by *actual rates of taxation* (Evans, 2005; OECD, 2010). MBV's (2013) estimate of the social pure rate of time preference is calibrated to reflect *actual observed rates of saving* (Arrow, 1995), and the estimate of the future growth rate of per capita consumption is based on the *actual long-term growth rate* of the US economy (Shiller, 2005). MASDR (p. 4) also suggests that our expected future growth rate is "particularly optimistic." However, it is noteworthy that MBV (2013) chose a lower estimate than the long-term average over the last hundred years would have strictly implied. Anyway, reducing this estimate even further would simply lower this estimate for the SDR below 3.5%.[9]

MASDR reiterates the Burgess-Zerbe (2011) view that their standard rate of 7% should also be applied to very long-term intergenerational projects. But MASDR does not respond to the view, which MBV (2013) and others find reasonable, that the distant future should be discounted at a lower rate.[10] This view emphasizes that there is considerable uncertainty as to a reasonable estimate of the SDR in the very far future, whether based on the SOC or on the STP. And, if there is *any* significant possibility of low rates in future, these will ultimately dominate in a weighted average of future discount factors. This reasoning implies declining discount rates over time. These will *not* result in time inconsistent policy choices, as long as the discount rate estimates are updated as more information becomes available. MBV (2013) agrees that BCA analysts should avoid folding other issues into the SDR. But uncertainty still implies a schedule of declining discount rates.

8 Of course, both alternatives are stylized reifications of the actual (chaotic) government budget decision-making processes. Especially in the US, with its separation of powers, there is no single entity that functions as "the government."

9 Formally incorporating uncertainty about the future growth rate into the Ramsey formula would lower the SDR due to a precautionary motive (Cropper, 2012).

10 See Cropper (2012) and the references therein as to the rationale for discounting the far future with a schedule of declining discount rates.

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4 Conclusion

Because both the SOC and the STP-SPC approaches are normative and do not generate testable hypotheses that would allow for empirical falsification, the choice of the correct method for choosing a SDR largely depends on what opportunities one believes are sacrificed when a public investment project goes forward: lower taxes and more current private consumption (the STP-SPC view), or lower government debt, lower interest rates and more current private investment (the SOC view).

Current OMB practice is to advocate the use of a 7% SDR as the default case whenever the main effect of a project or regulation "is to displace or alter the use of capital in the private sector…The 7% measure is an estimate of the average before-tax rate of return to private capital in the US economy." (OMB, 2003) But Burgess and Zerbe (2011) use a much higher 8.5% estimate of the US ROI. If one follows their methodology but substitutes 7% for the ROI, one obtains an estimate of the SOC of approximately 5.7%. And if one uses MBV's (2013) empirically-derived estimates of the key ROI parameters, which are based on financial market data and thus provide, *inter alia*, a better measure of the *marginal* (rather than the *average*) ROI, one obtains an estimate of the SOC of 4.7% (MBV, 2013). So, even if one accepts the MASDR comment view that every government project takes place (mostly) at the expense of a private investment, a SDR of around 5% is likely a better estimate. An even lower rate would be implied by the fact that any measure of the ROI is likely biased upward by the existence of negative externalities, and by the inclusion of private risk premia.[11] Since the difference between the MBV (2013) 3.5% rate and something less than 5% is not that large, perhaps there is hope for some agreement at over the correct number for the US SDR.

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11 We take the Arrow and Lind (1970) view that, due to missing insurance markets, the government has an advantage over the private sector in risk diversification, and this is reflected in the lower rates that the government pays on its debt, compared to private rates. See also Arrow (1995).

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