A Context-robust Measure of the disincentive cost of Unemployment Insurance

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In this paper we argue that the standard way of measuring the social cost from employment reductions in response to changes in unemployment insurance (UI) benefits using labor supply elasticities and marginal effects provides only a partial measure of the true disincentive effect and ensuing social costs of UI benefits. An important difficulty of the standard measures is that they are difficult to compare across different contexts, especially when the duration structure of unemployment differs substantially. For example in the case of UI extensions, the more individuals are at risk of exhausting benefits, the larger is the insurance-related transfer from UI and the higher is the effective incentive to respond to UI changes . Based on this insight, the paper proposes a straightforward alternative measure of the disincentive effect of UI: the ratio of the behavioral cost (BC) to the mechanical cost (MC) of a UI reform. The BC/MC ratio captures the labor supply distortion (similar to a deadweight loss) *relative* to the additional (mechanical) transfer induced by the UI reform. We show that this ratio captures the true social costs in the context of a canonical model of optimal UI as in Baily (1978) and Chetty (2008). We discuss how our alternative measure partly addresses the issue of shifting incentive structures as well. Another key advantage of the BC/MC ratio is that it can in principle be readily computed and compared across different types of UI reforms. We summarize the evidence regarding the BC/MC ratio for existing studies and find that it can have substantially different implications than traditional labor supply elasticities.[1]

I. A Generalized Measure of the Disincentive Effect of UI

To develop our measure of the disincentive effects of UI we use a continuous time model of an individual who becomes unemployed and claims UI benefits at time $t = 0$ with a finite time horizon T (See Schmieder and von Wachter (2016) for details). The individual chooses search effort s_t, normalized to be the arrival rate of job offers, that results in a search cost of $\psi_t(s_t)$. All jobs offer the same wage w, high enough that all offers are accepted, and once employed an individual keeps the job until T. Individual behavior can be summarized by the survival function $S_t = \exp\left(-\int_0^t s_t dt\right)$, which is the probability of remaining unemployed. The expected duration of unemployment is given as: $D = \int_0^T S_t\, dt$. The expected duration of receiving UI benefits is: $B = \int_0^P S_t\, dt$. We focus here on UI systems where unemployment benefits of level b are paid for a finite time horizon, the potential benefit duration P, so that $b_t = b$ for $t \leq P$ and $b_t = 0$ for $t > P$.

Most papers estimate the disincentive effect of UI either as the elasticity of unemployment duration D (or the hazard rate s_t) with respect to P or b, or as the marginal effect of P or b on D. While these are standard measures borrowed from the labor supply literature, they face important challenges in the context of UI because they do not sufficiently take into account that the underlying structure of unemployment durations (i.e., the shape of the survivor function) may differ across contexts. This has two implications. As a measure of moral hazard, the labor supply elasticity, say, does

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[1] The paper builds on and summarizes insights developed in two previous papers, Schmieder, von Wachter and Bender (2012) and Schmieder and von Wachter (2016).

not take into account that the effect of UI extensions on the incentive to search increases the closer an individual is to exhausting UI benefits. For example, even if dD/dP were the same in a boom and a recession, it is clear that the effect of a change in P on the incentive to search is much stronger in recessions when the exhaustion rate is higher. Hence, the 'true' moral hazard effect in this case would be smaller in recessions.

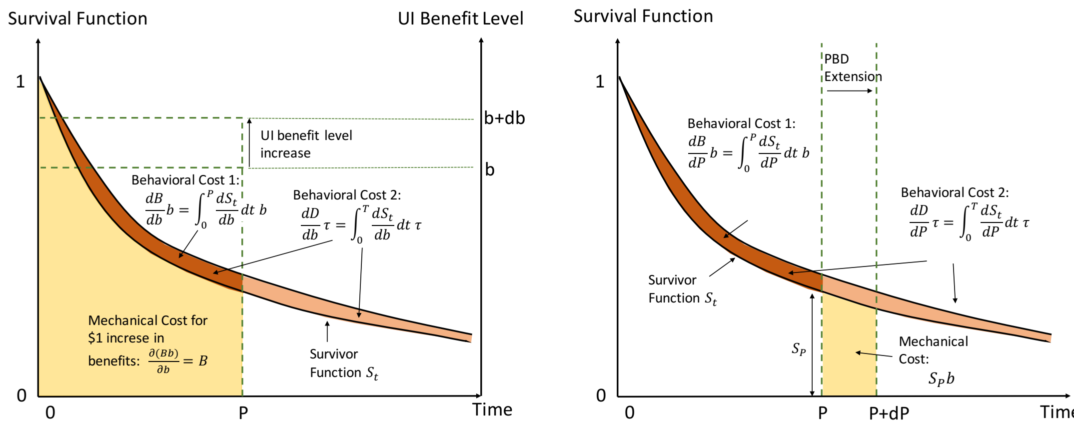
Marginal effects or labor supply elasticities are by themselves also insufficient for capturing the social cost of UI. Suppose again that dD/dP were constant over the business cycle. Given the exhaustion rate is higher, a given increase in potential benefit duration leads to a much larger effective transfer in recessions. Hence, compared to a boom, the shortfall in taxation from the disincentive effect *relative to the total benefits paid out* is much smaller in a recession.

As an alternative measure of the cost of labor supply responses to UI, we propose to scale the effect on unemployment durations on labor supply (the behavioral cost BC) by how much the policy change actually increases the transfer to the unemployed in the absence of behavioral responses. Following the public finance literature, we call this the mechanical cost MC of the program (though since this is the insurance transfer, it is per se not a cost to society). In the case of a benefit extension the share of individuals S_P who are exhausting their UI benefits receive b additional dollars of benefits and therefore the mechanical cost is $MC = S_P b$. Scaling the elasticity or marginal effect by MC in our example would drastically lower the disincentive effect in recessions relative to booms. In the case of an increase in the benefit level, a $1 increase would lead to B additional dollars in total UI payment, so that $MC = B$, which suggests scaling the effect on unemployment by B.

The resulting BC / MC ratio expresses how much tax revenue the government has to raise in order to finance one additional dollar in mechanical transfers, in addition to the transferred dollar itself. The BC/MC ratio is a particularly useful measure of the disincentive cost of UI, since it is solely based on the fiscal implications of a UI reform. Unlike the social value term does not rely on any knowledge of individual marginal utilities or assumptions about social preferences about the value of insurance / redistribution. The BC/MC ratio is directly comparable between different policy changes, such as benefit level changes, extensions, and other changes to the benefit path. Comparing the behavioral and mechanical effects of a policy change has a long tradition in public economics. While the number alone is not enough to judge the welfare implications of a UI reform, which also depends on the social value of the additional mechanical transfer, it isolates the positive (as opposed to normative) component of the effects of the reform.

That our new measure of the disincentive effect, the BC/MC ratio, can lead to very different conclusions can be seen in our previous paper, Schmieder, von Wachter and Bender (2012). There, we showed that scaling the nonemployment effect of UI extensions by the exhaustion rates suggests that the disincentive effect of UI is highly cyclical and much smaller in recessions, while the marginal effects and elasticities appear relatively stable across the cycle. This in turn provides a strong argument in favor of extending UI benefits in recessions, even in addition to additional macroeconomic stabilization arguments. In Schmieder, von Wachter and Bender (2012) we also explain how by scaling with the exhaustion rate, the BC/MC ratio partly adjusts for the fact that the true underlying incentive structure of UI varies over the business cycle and hence provides a measure of the 'true' underlying moral hazard of UI that is more comparable over the business cycle.

While the above argument is generally valid, one can show that the BC/MC ratio naturally arises from a model of optimal UI benefits in the spirit of Baily (1978) and Chetty (2008). We assume that individuals are hand-to-mouth consumers and thus lifetime expected utility of an individual is given as: $W = \int_0^T \{S_t u(c_{u,t}) + [1 - S_t] v(c_e) - S_t \psi_t(s_t)\}\, dt$, where $c_{u,t} = b_t + y_u$ consists of UI benefits and potentially other income, while



(a) UI Benefit Level Increases (b) UI Extensions

FIGURE 1. THE BEHAVIORAL AND MECHANICAL COSTS OF UI REFORMS

$c_e = w - \tau$ is equal to net of tax wage income. The social planner chooses b and P in order to maximize W subject to the constraint that expected tax revenue equals expected total UI payments plus other government expenditures. Taking the budget constraint into account we can write the marginal effect of increasing UI benefits level b on social welfare as:

$$(1) \quad \frac{dW}{db}\frac{1}{B\, v'(c_e)} = \underbrace{\frac{u'(c_{u,t\leq P}) - v'(c_e)}{v'(c_e)}}_{\text{Social Value}} - \underbrace{\frac{1}{B}\left(\frac{dB}{db}b + \frac{dD}{db}\tau\right)}_{\substack{\text{Behavioral Cost /}\\ \text{Mechanical Cost}}}$$

The marginal effect on welfare is scaled by the mechanical cost B of a \$1 transfer, valued at the marginal utility of consumption of the employed $v'(c_e)$. This allows one to interpret the left-hand side of the equation as the marginal effect on social welfare per additional dollar in transfers to the unemployed in the absence of behavioral responses (i.e., the mechanical cost) in units of the consumption value of those paying taxes. The first term on the right hand side is the social value of one additional dollar of transfers from the employed state (with marginal utility $v'(c_e)$) to the unemployed state (with marginal utility $v'(c_{u,t\leq P})$). The second term represents the behavioral cost BC of increasing the benefit level divided by the mechanical cost MC. Figure 1 (a) shows the intuition behind this BC/MC ratio. The shaded area under the original survival function represents the UI benefit duration and is equal to the mechanical cost of a marginal benefit level increase. An increase in benefits by db induces an upwards shift of the survival function due to a reduction in search intensity, which is costly to the social planner for two reasons: First it increases total UI outlays due to the increase in time spent on UI, dB, which is represented by the area between the survival function up to P. Second it reduces the tax revenue since the increase in unemployment duration reduces time in employment when individuals pay taxes, this is represented by the total area between the two survival functions (from 0 to T). We propose the ratio between the total behavioral cost and the mechanical cost as a new, general measure for the disincentive effects of changes to the UI system.[2]

The equivalent formula for the marginal welfare effect of an extension in P is given as:

[2]The behavioral cost component can also be written as $-\left(\eta_{B,b} + \eta_{D,b}\frac{D}{B}\frac{\tau}{b}\right)$, implying that a combination of typical elasticity estimates is a reasonable way of measuring the disincentive effect for benefit levels. However, it is not useful to directly compare these elasticity with $\eta_{D,P}$ for benefit durations.

$$\frac{dW}{dP}\frac{1}{S_P b\, v'(c_e)} = \underbrace{\frac{\tilde{u}'(c_{u,t>P}) - v'(c_e)}{v'(c_e)}}_{\text{Social Value}} \underbrace{- \frac{1}{S_P b}\left(\int_0^P \frac{dS_t}{dP}\,dt\,b + \frac{dD}{dP}\tau\right)}_{\substack{\text{Behavioral Cost/}\\ \text{Mechanical Cost}}} \tag{2}$$

The marginal welfare gain is scaled by the mechanical cost of an extension, $MC = S_P b$, and hence the expression can again be interpreted as the increase in the social welfare per \$1 additional mechanical transfer due to the benefit extension (in units of $v'(c_e)$). The first term on the right hand side corresponds again to the marginal social value of transferring an additional dollar which now depends on the marginal utility of an exhaustee (or more precisely: $\tilde{u}'(c_{u,t>P}) \equiv \frac{1}{b}\int_{y_u}^{y_u+b} u'(c)dc$). Figure 1 (b) illustrates the components of the second term. The mechanical cost is the area under the survival function between the original P and new level of potential durations $P + dP$ multiplied with the benefit level b, i.e. $S_P \times b$. The behavioral cost consists again of the additional UI expenditure due to the outward shift of the survival function $\frac{dB}{dP}b$, represented by the area between the survival functions up to P, and the decrease in tax revenue $\frac{dD}{dP}\tau$, represented by the total area between the survival functions.

The idea of using an optimal UI model to think about the magnitude of the disincentive effect of UI is of course at the core of Baily (1978), Chetty (2008) and many papers since. But in most contexts only parts of the components of the Baily-Chetty formula are estimated, for example, only the labor supply elasticity or only the consumption smoothing / social value effect. Even if both are estimated, implementing the entire formula typically requires extra assumptions, such as about the coefficient of relative risk aversion. We believe that it would be very useful for researchers to estimate and present the BC/MC ratio in addition to the usual marginal effects and elasticities, especially when a full implementation of the Baily-Chetty formula is beyond the scope of the particular exercise.

II. Empirical Evidence on the Disincentive Effects of UI

We now turn to providing empirical evidence on the disincentive effects of UI as measured by the BC/MC ratio based on the existing literature. We went through recent papers from the US and Europe that provide clean estimates of either the effect of benefit level changes or of UI extensions and calculated marginal effects, elasticities as well as the BC/MC ratio. Calculating the BC/MC ratio requires knowledge about the shape of the survival function and how the survival function changes in response to a UI reform. While future studies could easily calculate these components, we do not have such estimates for most studies that we reviewed. We therefore provide approximate BC/MC ratios where we calculate the approximation under the assumption that the hazard rate of exiting unemployment is constant throughout the unemployment spell. With a constant exit hazard we can write $\frac{dB}{db} = \frac{dD}{db}\xi$ and $\int_0^P \frac{dS_t}{dP}\,dt = \frac{dD}{dP}\xi$, where $\xi \equiv 1 - (1 + Ps)e^{-Ps}$. In this case the BC/MC ratio for a benefit level increase can be written as:

$$\frac{1}{B}\frac{dD}{db}(\xi b + \tau) = \frac{D}{B}\eta_{D,b}\left(\xi + \frac{\tau}{b}\right),$$

where the reformulation on the right hand side is useful since many studies report elasticity estimates ($\eta_{D,b} \equiv \frac{dD}{db}\frac{b}{D}$). Similarly the BC/MC ratio for a UI extension is given as:

$$\frac{1}{S_P b}\frac{dD}{dP}(\xi b + \tau) = \frac{1}{S_P}\frac{dD}{dP}\left(\xi + \frac{\tau}{b}\right)$$

While this approximation is not perfect it allows us to get a first sense about how behavioral costs vary across different contexts. The approximation also clarifies that the relationship between the elasticity or marginal effect typically reported and the

Table 1—Comparing Disincentive Effects of Unemployment Insurance

	Nonemployment		**UI Duration**		**BC/MC Ratio**	**BC/MC Ratio**
	Marginal Effect	Elasticity	Marginal Effect	Elasticity	3% UI tax	tax wedge
Panel A: Benefit Levels						
Mean		0.59		0.40	0.35	1.05
Median		0.53		0.30	0.32	0.76
25th Percentile		0.29		0.30	0.15	0.45
75th Percentile		0.80		0.54	0.39	1.49
Panel B: Benefit Extensions						
Mean	0.22	0.32	0.29	0.73	0.58	1.31
Median	0.20	0.33	0.28	0.58	0.52	1.29
25th Percentile	0.11	0.13	0.23	0.54	0.14	0.42
75th Percentile	0.31	0.43	0.34	0.67	0.94	1.89

Note: The table shows summary statistics of the effects of changes in UI benefit levels (Panel A) and potential UI benefit durations (Panel B) on non-employment durations, durations of UI benefit receipt and the BC/MC ratio. The 5th column calculates the BC/MC ratio using $\hat{\tau} = 3\%$. In the 6th column the BC/MC ratio is calculated using the OECD tax wedge for $\hat{\tau}$. The individual estimates are taken from Schmieder and von Wachter (2016), Table 1 and 2, but for Panel A we drop the largest outlier and for Panel B we drop estimates from 2 studies from Austria that focused on older workers that represented large outliers.

BC/MC ratio we propose here.

To obtain empirical estimates of the BC/MC ration, we can approximate τ/b using the fact that if $\hat{\tau}$ is the tax rate ($\tau = \hat{\tau}w$) and ρ the UI replacement rate ($b = \rho w$), then $\frac{\tau}{b} = \frac{\hat{\tau}}{\rho}$. We use the statutory replacement rates for each country in our literature review from OECD (2015) as a measure of ρ. We calculate the BC/MC ratio for two different assumptions for $\hat{\tau}$. First, we set $\hat{\tau}$ equal to the average worker contribution rate to the UI system across countries of around 3 percent, which has often been used in previous applications of the Baily-Chetty formula. As noted Lawson (2014) this understates the budget shortfall due to other taxes paid by workers, and therefore we also use an estimate of the average tax wedge on labor for each country from OECD (2015).

Table 1 shows summary statistics of our review of existing estimates in Schmieder and von Wachter (2016). Panel A shows the different measures of the disincentive effect of UI for UI benefit extensions. The mean elasticity of nonemployment duration with respect to benefit levels is 0.59 with an interquartile range of 0.3 to 0.8. The mean elasticity of UI benefit durations is smaller with a mean of 0.4 and an interquartile range of 0.3 to 0.54.

The mean BC/MC ratio under the assumption that nonemployment affects the social planner's budget only through the UI payroll tax of around 3 percent is 0.35 – that is in order to increase the mechanical transfer to the unemployed by \$1 the government has to raise an additional 35 cents in taxes (for a total tax revenue increase of \$1.35). Using the OECD tax wedge instead the BC/MC ratio is on average 1.05, meaning that in order to increase the mechanical transfer by \$1 an additional \$1.05 would have to be raised (for a total tax revenue increase of \$2.05).

Panel B shows corresponding numbers for benefit extensions. Most of the reviewed studies provide marginal effects as well as elasticities, which is why we present both. Interestingly the nonemployment elasticities of extensions are smaller on average then the elasticities for benefit level increases, while the UI duration elasticities are larger for extensions. However, as we argued before comparing these elasticities (or marginal effects) across studies is not necessarily meaningful because they can mask very different implied transfers. Turning to the BC/MC ratios we find that both under the low tax assumption $\hat{\tau} = 3\%$ and the assumption that $\hat{\tau}$ is equal to the tax wedge, the mean BC/MC ratio is larger for benefit extensions. For example using the mean BC/MC ratio for extensions in the last column suggests that in order to increase the transfer to the unemployed by 1 dollar an additional \$1.31 in tax revenue would have to be raised compared to only \$1.05 additional revenue in the case of a benefit level increase. In that sense it appears that at least on average benefit extensions may be associated with larger efficiency costs relative to the implied transfer. Note, however, that in the case of benefit extensions the additional transfer goes to individuals who are exhausting their UI benefits who are likely to have lower consumption levels and higher marginal utility from consumption. Thus the social value may well be higher for extensions.

While this is not apparent from the summary statistics, comparisons across studies show that the BC/MC ratio often leads to opposite conclusions regarding the size of the disincentive effect. For example, from Katz and Meyer (1990) we calculated a marginal effect $dD/dP = 0.2$, but a BC/MC ratio of 1.89 (using the tax wedge), while from Johnston and Mas (forthcoming) we obtained $dD/dP = 0.3$, but a BC/MC ratio of 0.69. Thus while a comparison of the marginal effects across these two US studies might suggest that the disincentive effect of a UI extension is 50 percent larger in the aftermath of the Great Recession compared to the earlier estimates (based on a range of labor market conditions), one would reach the opposite conclusion based on the BC/MC ratio.

III. Conclusion

We propose to use the BC/MC ratio as an alternative measure of the disincentive effects and fiscal costs of changes in UI benefits. Besides its intuitive interpretation, the BC/MC ratio allows for meaningful comparisons across studies, but also within studies across different demographic groups, locations or time periods. This measure can be readily computed in any situation where the standard elasticities or marginal effects are identified. Based on our review, we find that there is significant heterogeneity in BC/MC ratios across contexts. In many instances comparing the BC/MC ratios across studies leads to different conclusions from comparing marginal effects or elasticities.

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