In Defense of the Kaldor-Hicks Criterion

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Abstract

This paper argues the Kaldor-Hicks criterion can be a sensible criterion for judging the policy benefit in a dynamic economy if the agents can trade state-contingent securities regarding a future policy change. When the probability of the policy change is very small, ex-ante security trades can increase everyone's consumption after the policy implementation when the Kaldor-Hicks criterion is met, even without an ex-post redistribution by the government.

Keywords: Kaldor-Hicks criterion, cost-benefit analysis, heterogeneous-agent macroeconomics, redistribution

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1 Introduction

Many economic policies, especially macroeconomic policies, create potential winners and losers. The challenge for policymakers is to decide whether to implement a policy in such a situation. A frequently used approach is the cost-benefit analysis: if the total benefit from the policy exceeds the total cost, a policy is considered desirable. The background of the cost-benefit analysis is the so-called Kaldor-Hicks criterion in welfare economics.[1] When (i) the amount that losers are willing to pay the winners for not conducting the policy is smaller than the benefit for winners and (ii) the amount winners are willing to compensate the losers for conducting the policy exceeds the loss of the losers, the policy is considered desirable according to the Kaldor-Hicks criterion.

The major critique of the Kaldor-Hicks criterion is that the compensation from winners to losers doesn't have to actually take place: the transfer is purely hypothetical. Thus, if, for example, a social welfare function places more weight on the losers' loss than the winners' gain, the Kaldor-Hicks criterion may not be compatible with maximizing social welfare.[2] Such an issue does not occur if we stick to the Pareto criterion, which imposes a higher bar on conducting a policy.

This type of issue is particularly severe in the macroeconomic context. In fact, in many modern macroeconomic analyses that utilize heterogeneous-agent models with incomplete markets, such a conflict is often explicit.[3] If we insist on the Pareto criterion to justify a policy intervention, most of the policies cannot take place.

This paper defends the use of the Kaldor-Hicks criterion in such a situation. In a dynamic economy, the potential losers due to a future policy won't sit quietly and wait for the policy to be carried out. When the security market is sufficiently developed, one can reasonably think potential losers have the opportunity to try to hedge the policy risk. In the simple model described below, such hedging arrangements can naturally result in a consumption increase for everyone for a policy that satisfies the Kaldor-Hicks criterion. In such a situation, the government transfer is not necessary to justify the use of the policy that can create winners and losers as a direct consequence.

[1] See Kaldor (1939), Hicks (1939), and Scitovszky (1941).

[2] In the cost-benefit analysis chapter of a public finance textbook, Gruber (2007) writes, "The costs and benefits of a public project do not necessarily accrue to the same individuals ... In theory, if the benefits of this project exceed its costs, it is possible to collect money from those who benefit and redistribute it to those who lose ... In practice, however, such redistribution rarely happens."

[3] See, for example, Domeij and Heathcote (2004) for capital taxation, Mukoyama (2013) and Setty and Yedid-Levi (2021) for the unemployment insurance policy, and Bachmann et al. (2020) for fiscal volatility.

2 Model

2.1 Setup

Consider a two-period endowment economy with two types of consumers, type I and type II. Each type has a continuum of population 1. The type-I consumers are price-takers and maximize the utility

$$u(c_1) + E[u(c_2)],$$

where c_1 is the consumption in period 1 and c_2 is the consumption in period 2. $E[\cdot]$ is the expectation operator. Similarly, type-II consumers are also price-takers and maximize

$$u(c_1') + E[u(c_2')],$$

where c_1' is the consumption in period 1 and c_2' is the consumption in period 2. Below, the variables for type-II consumers are denoted with prime ($'$). Each consumer receives $e > 0$ units of the consumption good as an endowment at the beginning of each period.

2.2 Policy

Suppose the government may conduct a policy at the beginning of the second period. The policy creates "winners" and "losers": the type-I consumers receive $\gamma > 0$ units of the consumption good as a result of the policy, and the type-II consumers lose $\lambda \in (0, e)$ units of the consumption good as a result of the policy.

Is this policy desirable? First, consider the static perspective: the welfare comparison at the beginning of the second period. With the Pareto criterion, we cannot judge the desirability of this policy, because the type-I consumers are better off as a result of the policy, whereas the type-II consumers are worse off.

In many practical situations, policymakers resort to cost-benefit analysis, that is, comparing γ and λ. The policy is conducted when the benefit (γ) outweighs the cost (λ). The background of the cost-benefit analysis is the Kaldor-Hicks criterion. As discussed in the Introduction, the Kaldor-Hicks criterion is criticized because the compensation from the winners to the losers is hypothetical. That is, the criterion does not require that the government enforces compensation.

In the following, I show that in the dynamic economy outlined above, the government does not have to enforce compensation. In fact, the compensation naturally occurs as a result of the market transaction.

2.3 Dynamic perspective

Suppose the policy is implemented randomly and the probability the policy takes place is $\pi \in (0, 1]$. Assume that, in the first period, a type-I consumer can issue a contingency claim that pays one unit of the consumption good to the owner of the claim if the government carries out the policy. Let p be the price of the claim, let x be the supply of the claim by a type-I consumer, and let x' be the demand of the claim by a type-II consumer. All consumers act competitively in the claims market, and the market equilibrium implies $x = x'$. For simplicity, we do not allow any other borrowing and saving. This assumption turns out not to be restrictive in the equilibrium we focus on below.[4]

The optimization problem for the type-I consumer is

$$\max_{x,c_1,c_2} \; u(c_1) + \pi u(c_2^P) + (1-\pi)u(c_2^N),$$

subject to

$$c_1 = e + px,$$

$$c_2^P = e + \gamma - x,$$

and

$$c_2^N = e,$$

where c_2^P is the consumption when the policy is conducted and c_2^N is the consumption when the policy is not conducted. The utility function satisfies $u' > 0$, $u'' < 0$, and the usual Inada condition $\lim_{c\to 0} u'(c) = \infty$ and $\lim_{c\to\infty} u'(c) = 0$. The problem for the type-II consumer is

$$\max_{x',c_1',c_2'} \; u(c_1') + \pi u(c_2^{P\prime}) + (1-\pi)u(c_2^{N\prime}),$$

subject to

$$c_1' = e - px',$$

$$c_2^{P\prime} = e - \lambda + x',$$

and

$$c_2^{N\prime} = e,$$

where $c_2^{P\prime}$ is the consumption when the policy is conducted and $c_2^{N\prime}$ is the consumption when the policy is not conducted.

The first-order conditions for both consumers and the equilibrium condition $x = x'$ imply

$$\frac{u'(e+\gamma-x)}{u'(e+px)} = \frac{u'(e-\lambda+x)}{u'(e-px)} \tag{1}$$

and

$$p = \pi \frac{u'(e+\gamma-x)}{u'(e+px)}. \tag{2}$$

[4]The claim enables risk sharing between the type-I consumers and the type-II consumers. The asset market is not complete, because there are two states in the second period with only one asset. Adding a state-noncontingent bond (or any other independent asset) can complete the market. We have repeated the exercises below with the addition of a bond, and the main message of the paper remains the same. In particular, the result analogous to Proposition 1 also holds in that case.

These two equations solve for the equilibrium (p, x).

The following proposition considers a situation where $\pi \to 0$. When the policy is regarded as a shock, this situation is often called the "MIT shock" in macroeconomics. This case is of particular interest because most of the macroeconomic-policy analysis treats the policy change as an unanticipated ("measure zero") event, which is equivalent to considering the MIT shock. If no securities regarding the shock are traded ex ante, the MIT-shock outcome would be equivalent to the static outcome above. However, if the security trade is allowed, the policy outcome is dramatically different.

Proposition 1 *As $\pi \to 0$, the equilibrium allocation $(p, x) \to (0, (\gamma + \lambda)/2)$.*

Proof. First, we show $p \to 0$ as $\pi \to 0$. From (2), because px is bounded by $[-e, e]$, $u'(e+\gamma-x) \to \infty$ if p converges to a value strictly larger than zero. Thus, $x \to e+\gamma$. However, this result implies $u'(e - \lambda + x) = u'(2e + \gamma - \lambda)$ is finite, and because $px \to p(e + \gamma) > 0$, (1) cannot be satisfied, which is a contradiction. Therefore, $p \to 0$. Second, because $p \to 0$, (1) implies $u'(e + \gamma - x) - u'(e - \lambda + x) \to 0$, and therefore, $x \to (\gamma + \lambda)/2$. $\blacksquare$

Proposition 1 implies $c_1 \to e$, $c_2^N \to e$, $c_2^P \to e + (\gamma - \lambda)/2$, and $c_2^{P'} \to e + (\gamma - \lambda)/2$. This outcome is in contrast to the static case (i.e., no security trade ex ante) in which $c_2^P \to e + \gamma$ and $c_2^{P'} \to e - \lambda$.

In the current environment, the policy is desirable (when carried out) for everyone in the economy at the limit of $\pi \to 0$ if and only if $\gamma > \lambda$. This condition exactly corresponds to the Kaldor-Hicks criterion.[5] Moreover, in this case, the transfer through the claims market indeed occurs; that is, the transfer is not hypothetical. With a very small value of π, the resulting allocation with policy improves consumption for both types of consumers in the second period with almost no loss in the first-period consumption.

Figures 1 and 2 plot the values of (c_1, c_1') (Figure 1) and $(c_2^P, c_2^{P'}, c_2^N, c_2^{N'})$ (Figure 2) for various values of $\pi \in (0, 1]$ in a numerical example. Here, the utility function is the natural log and the parameter values are $e = 5$, $\gamma = 11$, and $\lambda = 1$. Note that if the policy is not implemented, $(c_1, c_1') = (5, 5)$ and $(c_2^P, c_2^{P'}, c_2^N, c_2^{N'}) = (5, 5, 5, 5)$. As $\pi \to 0$, the outcome approaches the one in Proposition 1: $x = (\gamma - \lambda)/2 = 5$, and therefore, $(c_1, c_1') \to (5, 5)$ and $(c_2^P, c_2^{P'}, c_2^N, c_2^{N'}) = (10, 10, 5, 5)$. In this situation, c_2^P and $c_2^{P'}$ are both 10, which is larger than $c_2^N = c_2^{N'} = 5$. Therefore, the policy results in an "almost Pareto-improving outcome" in the sense that the policy implements a Pareto-improving outcome ex post with a small loss in c_1'. This result is achieved despite the fact that the type-II consumers are "losers" in the policy.[6]

[5] Mukoyama (2021) points out that the MIT-shock outcome is different depending on whether the hedging arrangements can be made beforehand. In this paper, the important (and novel) point is that the Kaldor-Hicks criterion can provide a reasonable policy decision.

[6] Note that here we are comparing the situations where the policy happens to be carried out and where it is not. The comparison of ex-ante welfare with different values of π is an entirely different question. We consider that question in the next section.

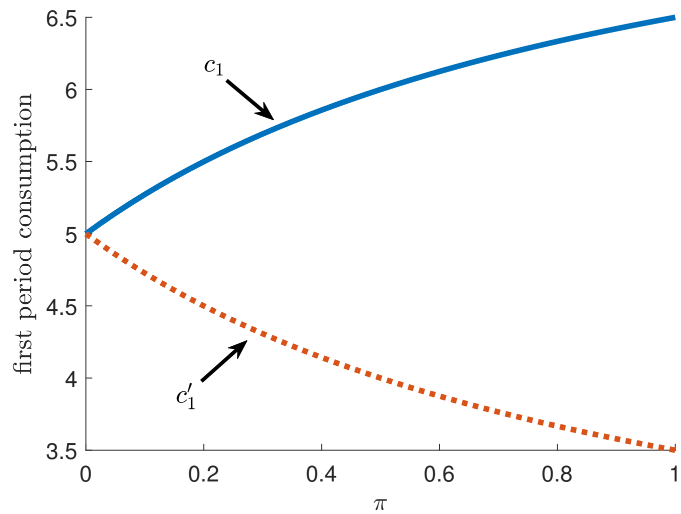

Figure 1: First-period consumption

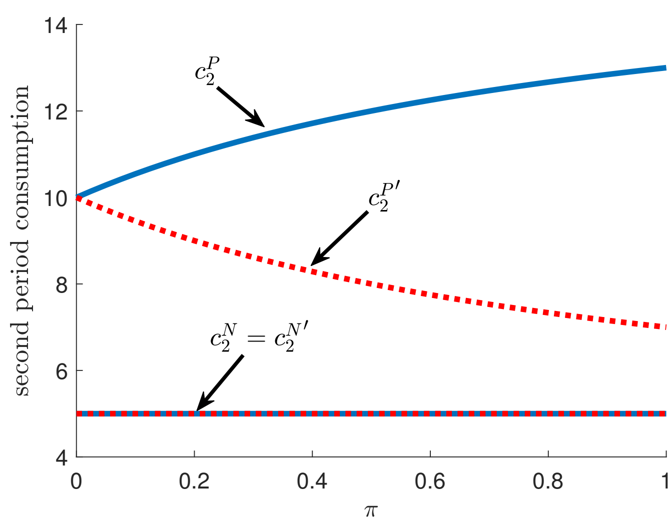

Figure 2: Second-period consumption

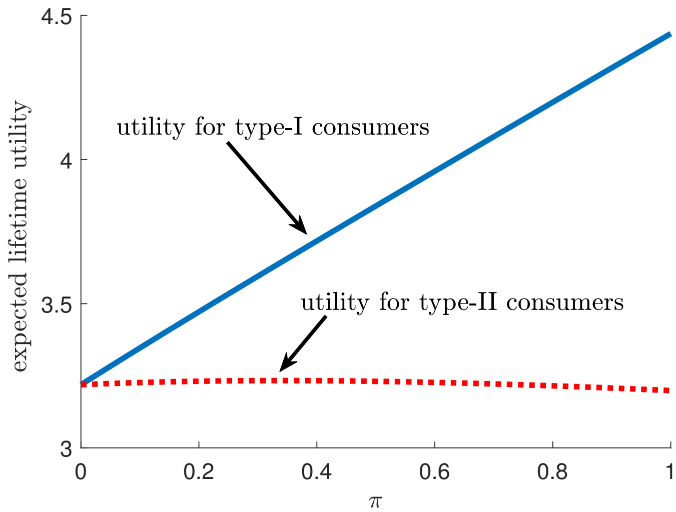

Figure 3: Expected lifetime utility for both types of consumers

The figures show that as π becomes larger, both c_1' and $c_2^{P\prime}$ become smaller. However, the main message remains true: $c_2^P > c_2^N$ and $c_2^{P\prime} > c_2^{N\prime}$ hold. Although some sacrifice in c_1' is necessary in this case, the loss is small when π is small. Therefore, the result in Proposition 1 is not a "knife-edge" outcome in the limit.

3 Lifetime welfare

In the previous section, we call the policy outcome "almost Pareto improving" when period-2 consumption for both types of consumers increases with the policy implementation. We add the term "almost" because loss of consumption can occur in period 1 for type-II consumers. The previous section does not explicitly compare the gains and losses across periods. One way to make such a comparison is to compare the expected lifetime welfare.

Figure 3 plots the expected lifetime utility for the type-I consumers and type-II consumers using the previous section's numerical example. One can observe that, when $\pi = 0$, the policy is never conducted, and therefore, the utility is $2 \times \log(e)$. As π increases (note no jump occurs in utility at $\pi = 0$), the utility for type-I consumers naturally increases. What happens to the type-II consumers' utility is intuitively less obvious. In Figure 3, the utility for type-II consumers first increases and then decreases with π. Therefore, a small $\pi > 0$ can be a Pareto improvement over $\pi = 0$ in terms of the ex-ante lifetime welfare.[7] This result is of

[7]In this paper, we treat the probability of carrying out the policy, π, as an exogenous parameter. The probability $\pi < 1$ can represent political constraints, for example. An alternative formulation is the government *chooses* π to maximize a certain objective. More concretely, the government chooses π first and publicly announces it (with commitment). Next, the asset market for the contingency claim opens. Then

independent interest because the type-II utility would be monotonically decreasing in π in the absence of security trades.

Note that, in contrast to the comparison of period-2 consumption (done after Proposition 1), the Kaldor-Hicks criterion does not provide guidance for the policy evaluation based on the expected lifetime welfare. The Pareto improvement in terms of lifetime welfare with $\pi > 0$ (demonstrated above) can occur only when γ is sufficiently large. (The Kaldor-Hicks criterion, $\gamma > \lambda$, is not sufficient for type-II consumers to experience a lifetime welfare gain with increasing π from zero.) This contrast clarifies the Kaldor-Hicks criterion is useful in evaluating the outcome *after* the policy (versus no policy), that is, $(c_2^P, c_2^{P'})$ in comparison to $(c_2^N, c_2^{N'})$, and not in evaluating the ex-ante expected lifetime welfare.

4 Conclusion

This paper argues the Kaldor-Hicks criterion can be a sensible criterion for policy evaluation in a dynamic economy if the agents can trade state-contingent securities regarding future policy change. When the ex-ante probability of the policy change is small, ex-ante security trades can attain a consumption gain for everyone from the policy when the Kaldor-Hicks criterion is met, even without the ex-post redistribution by the government. Even when such securities do not exist, the Kaldor-Hicks criterion provides a useful "frictionless" benchmark.

One corollary of this paper's results is that purely redistributive policies may be ineffective for redistribution if the losers of the policy can hedge the policy risk. The implication is not that we should not conduct redistributive policies. It is rather that when considering policies that involve (implicit or explicit) redistribution, we have to be aware of whether the losers of the policy have a way to hedge against the policy change. For example, if the policy is to increase the tax to the very rich, the very rich consumers are likely to have access to hedging opportunities, and therefore, the policy may lose its effectiveness in terms of redistribution. If the policy is to cut the unemployment insurance benefits, the unemployed workers will be unlikely to have the means to hedge against the policy change, and therefore, they will be indeed likely to suffer from a loss as the final outcome.

the government runs a public lottery whereby it conducts the policy with the winning probability π. Figure 3 implies the government can make all consumers better off (compared to no policy) by choosing a (small) strictly positive value of π.

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