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Discounting, inequality and economic convergence

Christian Gollier¹

Toulouse School of Economics (University of Toulouse), 21 Allée de Brienne, 31015 Toulouse, Cedex 6, France



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ABSTRACT

The aim of this paper is to examine the impact of inequalities and economic convergence on the efficient discount rate when international credit and risk-sharing markets are inefficient. We consider an economy in which initial consumption levels and growth expectations are heterogeneous. In the benchmark case in which relative inequalities are permanent and relative risk aversion is constant, inequalities do not affect the discount rate. We derive necessary and sufficient conditions under which permanent inequalities reduce the discount rate. We also show that the anticipation of economic convergence raises the efficient discount rate when relative prudence is larger than unity.

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Introduction

The classical reference for the determination of the efficient discount rate is the Ramsey rule (Ramsey (1928)) which states that in the absence of a pure preference for the present, the discount rate should be equal to the product of the growth rate of consumption by the degree of (intertemporal) inequality aversion. In a growing economy, the discount rate is the minimum internal rate of return of safe projects that compensates for the increase in intergenerational inequalities that these investments generate. The Ramsey rule has been extended to the case of an uncertain growth rate of consumption by Hansen and Singleton (1983), Gollier (2002), or Weitzman (2007) for example. The key ingredient of this literature is prudence. An agent is prudent if she has a precautionary motive to save, i.e., if she saves more when her future income becomes more uncertain. Thus, if the representative agent is prudent, the uncertainty affecting consumption growth should reduce the discount rate to reflect a precautionary motive to invest. Thus, any discussion on the socially desirable level of the discount rate should have two dimensions, the intensity of intergenerational inequalities and inequality aversion on one side, and the intensity of future consumption risk and prudence on the other side.

From this point of view, the evaluation of any worldwide effort to fight climate change raises a difficulty because initial consumption levels and future growth expectations and risk are extremely heterogeneous around the world. How do these heterogeneities affect the rate at which one should discount the future? Should we just use the Ramsey rule with the growth rate of the world consumption per capita, thereby basically ignoring intragenerational inequalities? How does the belief in a secular reduction in intragenerational inequalities through economic convergence affect the way one should treat intergenerational inequalities in discounting?

E-mail address: christian.gollier@tse-fr.eu

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Most models aimed at determining the rate at which one should discount future cash flows assume that there is a representative agent in the economy.² As long as risks and credit markets are efficient, this assumption is without loss of generality (Wilson, 1968). However, risk and credit markets are not efficient, in particular when we consider long time horizons in a worldwide perspective. Commitment problems, transaction costs, adverse selection and moral hazard limit our ability to reallocate consumption and risks efficiently across different countries and through time. An immediate consequence of this observation is that the law of one price does not hold. In particular, the intertemporal marginal rate of substitution becomes individual-specific in this context. Different agents will thus use different discount rates to evaluate the same future consumption benefit. To illustrate this, observe that different monetary zones have different interest rates. Countries facing different long-term interest rates will not have the same attitude towards green investments. China, whose growth expectations are much more promising than in the western world, should value carbon less than European countries for example. Moreover, with inefficient credit markets, the global welfare impact of an international climate policy will depend upon who will bear its costs and benefits. In this paper, we consider a simple benchmark case in which all costs and benefits are equally shared in the population.

The efficient discount rate is the rate of return of a safe investment that has no impact at the margin on intertemporal social welfare. In this paper, we consider the standard utilitarian Social Welfare Function (SWF) in which all economic agents have the same rate of pure preference for the present and the same utility function. The SWF is the sum of the individual discounted expected utilities. In this classical additive framework, inequalities under the veil of ignorance play the same role as uncertainty, and the concavity of the utility function can be interpreted as the aversion towards intragenerational and intergenerational inequalities.

Suppose first that there is no economic convergence in the sense that all agents face the same prospect of growth, i.e., the same probability distribution of the growth rate of their own consumption. Under the veil of ignorance, the impact of inequalities in the Ramsey model is equivalent to adding the same multiplicative risk to final consumption per capita at all dates. What is the effect of this additional permanent risk on the discount rate? This question is related to the literature on background risk (see for example Pratt and Zeckhauser, 1987; Gollier and Pratt, 1996) in which it is shown that an additive background risk raises the concavity of the collective utility function under realistic conditions on the original utility function. We use similar techniques to examine the condition under which stable intragenerational inequalities raise the aversion to intergenerational inequalities, thereby raising the discount rate of growing economies. In the [Discounting in an unequal world under certainty](#) section, we characterize the impact of intragenerational inequalities on the aversion to intergenerational inequalities. In The effect of economic convergence on the discount rate section, we characterize their impact on the precautionary motive to invest. We show that in the benchmark case with constant relative risk aversion, stable intragenerational inequalities have no effect on the aversion to intergenerational inequalities and on the discount rate.

But inequalities are usually not stable through time. Standard growth theory predicts that countries behind the technology frontier should be able to catch up rapidly by adopting technologies that have been developed elsewhere. This seems to have happened recently. Rodrik (2012) claims that growth in developing countries nearly tripled from around 2% in the 1980s to almost 6% before the crisis of 2008. Even South American countries and Africa have recently been part of the high-growth club. However, convergence is never certain, as it relies on the implementation of complex policies that strongly depend upon the socio-economic and cultural context (Rodrik, 2012). After all, over the last two centuries, some poor countries experienced long periods of convergence before switching back to low growth. But by pure extrapolation from the recent past, many experts now speculate that this time is perhaps different. Spence (2011) makes the case for a twenty-first century of high and even accelerating growth in the developing world and a new convergence with the rich world. In this paper, we explore the question of the impact of these beliefs on the way the future should be discounted. Convergence reduces inequality over time.³ Under the veil of ignorance, it reduces the uncertainty for future generations. It thus reduces the precautionary motive to invest. In line with this intuition, we show in this paper that the anticipation of economic convergence raises the discount rate when relative prudence is larger than unity. Using worldwide growth data from 1969 to 2011, we estimate the speed of convergence embedded in the stochastic world growth process and its impact on the discount rate.

The main message of the paper is twofold. First, when relative risk aversion is constant, the existence of stable relative inequalities has no effect on the discount rate. Second, the process of worldwide economic convergence has a sizeable positive impact on the level of the discount rate to be used for maturities at which this convergence is likely to materialize. The structure of the paper is as follows. In the [Discounting in an unequal world under certainty](#) section, we examine a model in which individual growth rates are certain. We explore in the [Discounting in an unequal world under uncertainty](#) section the case of uncertain growth, but we assume that relative inequalities are constant through time. We relax this assumption in The effect of economic convergence on the discount rate section, whereas we calibrate the model in the Calibration section. Some concluding remarks are provided in the Conclusion section.

Discounting in an unequal world under certainty

We consider an economy in which agents consume a single consumption good at each discrete date from $t=0$ on. Agents are indexed by $\theta \in \Theta$ whose distribution is characterized by the cdf $H: \Theta \rightarrow [0, 1]$. They all have the same rate of impatience δ

² A noticeable exception is Azar and Sterner (1996) and Emmerling (2010) in the context of climate change.

³ The impact of international convergence on inequalities may be partially offset by the increased inequalities within the developed world (Piketty, 2014).

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