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Abstract

This paper proposes Bayesian estimates for welfare effects of consumption fluctuations and growth. Annual data from 82 developed and developing countries indicate a large degree of uncertainty as regards point estimates. Moreover, the comparison between the welfare gain from consumption stabilization and the welfare gain from growth yields inconclusive results for many developed and developing countries. These findings suggest the need for caution in drawing policy conclusions from point estimates.

- Keywords: Business Cycles, Growth, Welfare.
  JEL Classification: E52, F42, C33.

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1 Introduction

Lucas (1987) measures the welfare cost of consumption fluctuations as the percentage increase in consumption, across all dates and states, required to leave a representative agent indifferent between consumption fluctuations and a smooth consumption path. According to this definition, he obtains an estimate of 0.042 percent of consumption in the USA.[1] Lucas then estimates the welfare loss of a one percent reduction in the growth rate at 20 percent of consumption. These results lead Lucas to conclude that further stabilization would yield little welfare gain in the USA and that growth should be the priority of macroeconomic policies.

A large body of research has challenged Lucas' estimations by altering his modeling framework. First, whereas Lucas employs a model based on a trend-stationary consumption process and a CRRA utility function, Obstfeld (1994) and Dolmas (1998) adopt a martingale consumption process and recursive preferences of Epstein and Zin (1989). The predictions of their model indicate higher welfare costs of fluctuations ranging from 0.1 to 4.31 percent. Second, another line of research relaxes Lucas' assumptions on homogenous agents and perfect capital markets. For instance, Imrohoruglu (1989) considers a general equilibrium model with idiosyncratic shocks and liquidity constraints and finds the welfare cost of fluctuations in the range of $0.3 - 1.5$ percent. Atkeson and Phelan (1994) extend Imrohoruglu (1989) to the endogenous labor supply and asset pricing. Their results indicate little welfare gain from stabilization as does Lucas (1987). In a related study, Krusell and Smith (1999) propose a model with a variety of heterogeneity including employment status, wealth and preferences. They find that poor unemployed individuals who face liquidity constraints and rich individuals would benefit from stabilization while the middle-income class would lose. As a result, the welfare gain from eliminating fluctuations is negligible for the aggregate economy.

Third, Tallarini (2000) addresses the problem in a real business cycle (RBC) model with Epstein-Zin type preferences, which are calibrated to be consistent with observed asset prices in the USA. He finds much larger welfare cost of fluctuations as of 44 percent. Otrok (2001) also considers an RBC model. However, he finds little welfare gain from stabilization with non-separable preferences, the parameter values of which are chosen to match observed fluctuations in the USA. The fourth strand of the literature is based on endogenous growth models. For instance, Barlevy (2004) proposes a frame-

[1] This result is obtained with a coefficient of relative risk aversion equal to 5. For risk aversion levels of 10 and 20, Lucas estimates the welfare cost of fluctuations at 0.084 and 1.7 percent, respectively.

work with diminishing returns on investment. As a result, stabilization generates higher growth through the reallocation of investment from periods of high investment to periods of low investment. In turn, he finds the welfare cost of fluctuations to be substantially higher than in the original Lucas exercise. However, Francois and Lloyd-Ellis (2006) challenge this finding in a model where fluctuations and growth are endogenously determined. Moreover, their model generates a positive relationship between fluctuations and growth as in Blackburn (1999). In this set-up, stabilization induces welfare costs. For a detailed survey of the literature, see Barlevy (2005), Imrohoroglu (2008) and Lucas (2003).

This brief review shows that different modelling assumptions yield different estimated values for the welfare cost of fluctuations. In this article, I take a different approach to examining the welfare effects of consumption fluctuations and growth**.** Instead of proposing another model economy, I investigate the impact of parameter uncertainty on welfare effects. For this purpose, I use the model economy proposed in Dolmas (1998) and Obstfeld (1994) and assess parameter uncertainty with Bayesian inference. In particular, the sample from the posterior distribution of welfare effects is obtained by repeatedly drawing parameters of a consumption process from their posterior distribution. Moreover, I estimate the posterior distribution for the difference between the welfare cost of consumption fluctuations and the welfare effects of growth. Subsequently, a 90 percent credible interval is constructed to gauge the uncertainty on estimates of welfare effects.[2] This metric also allows to examine whether the welfare gain from consumption stabilization and the welfare gain from growth are significantly different from one another. Lucas (1987) and subsequent studies have relied on point estimates for such welfare comparison, thereby neglecting the uncertainty surrounding their estimates. However, by ignoring uncertainty, one cannot make statements about how likely these estimates are from their population values. As a result, policy conclusions drawn from point estimates should be taken with caution.

My second contribution to the discussion relates to a large number of countries included in the empirical analysis. In particular, I examine data on 82 developed and developing countries while earlier studies mostly focus on the USA. The few existing cross-country studies include Pallage and Robe (2003) who compare point estimates for welfare effects across a group of African countries and the USA. Giannone and Reichlin (2005) compare consumption responses to technology shocks between the Euro area and the USA and

[2] The credible interval has a different interpretation than the confidence interval notion used in frequentist statistics. For instance, a 90 percent credible interval (or region) gives the interval of minimum length that contains the true value of a parameter with probability 90 percent.

interpret the results in terms of the welfare cost of fluctuations. Finally, Van Wincoop (1994) examines the welfare gain from international risk sharing in the USA, Japan and European-OECD countries.

Consumption data has three main characteristics: the trend growth, the size of fluctuations, and the degree of persistence of these fluctuations. Given the differences in these three parameters and their uncertainty, how large are welfare effects of consumption fluctuations and growth in developing countries compared to those in developed countries? Are these welfare effects similar across countries in each group? For instance, are welfare effects of consumption fluctuations different between the USA and the European industrialized countries? Analysis of data from a large number of developing and developed countries enables these general questions to be addressed.

Moreover, developing countries represent a natural framework for the Lucas-type welfare comparison. In particular, these countries display strong volatility in consumption such that successful stabilization policies should substantially improve the welfare of their residents. However, there has been an increasing emphasis on growth in these countries. For instance, The World Bank (2004) argues that Africa needs to achieve a seven percent long-term growth rate in order to meet the target for poverty reduction of the Millennium Development Goals. To what extent then should developing countries focus on stabilization or on growth [3] or on both policies?

The results show wide credible intervals for the welfare cost of consumption fluctuations in developed and developing countries, which indicates large uncertainty as regards point estimates. Moreover, credible intervals for the difference between the welfare gain from consumption stabilization and the welfare gain from growth include zero for many developed and developing countries. These findings are robust as regards sub-samples analysis and on different assumptions about the risk aversion parameter and the intertemporal elasticity of substitution.

[3] Blackburn (1999) provides a theoretical support for the trade-off between stabilization and growth. Using an endogenous growth model, he shows that monetary stabilization policies lead to a lower long-term growth. This result is based on a positive link between growth and volatility found in Blackburn (1999). However, the relationship between growth and volatility hinges on the mechanism that generates technological progress. When it is generated by the creative destructive mechanism, the link between growth and volatility is positive (see, for example, Aghion and Saint-Paul (1998a), Aghion and Saint-Paul (1998b); and Caballero and Hammour (1994)). However, if the mechanism generating technological progress is learning by doing, the relationship between growth and volatility is found to be negative (see, for example, Martin and Rogers (1997); and Ramey and Ramey (1991)).

This paper is further organized as follows: Section 2 presents the theoretical framework; Section 3 gives empirical results; Section 4 provides the sensitivity and sub-period analysis; and the last section concludes.

2 Theoretical framework

2.1 Model economy

The model is taken from Dolmas (1998) and Obstfeld (1994). The ingredients are the recursive preferences of Epstein and Zin (1989) and a stationary autoregressive process for consumption growth.

2.1.1 Consumption

Denote real per capita consumption by $C_t, t = 0, \ldots, T$, and assume that the growth rate $g_t = \frac{C_t}{C_{t-1}} - 1$ follows an $AR(\ell)$ stationary process

$$g_t = \phi_0 + \sum_{i=1}^{\ell} \phi_i g_{t-i} + \varepsilon_t, \tag{1}$$

where ϕ_0 is the constant term, the ϕ_i, $i = 1, \ldots, \ell$, are AR coefficients, and ε_t is the error term, which is assumed to be $i.i.d$ normally distributed as $\varepsilon_t \sim N(0, \sigma^2)$. From Eq. (1) the long-term growth rate of consumption is defined as the unconditional mean of g_t : $g = Eg_t = \phi_0/(1 - \sum_{i=1}^{\ell} \phi_i)$. Using the approximation $\ln(1 + g_t) \simeq g_t$, Eq. (1) is equivalent to assuming that $\ln C_t$ follows an $I(1)$ process with serially correlated increments.[4] This implies that innovations in growth have permanent effects on consumption.

2.1.2 Preferences

With persistent shocks, Obstfeld (1994) argues that the risk aversion parameter and the intertemporal elasticity of substitution (IES) play specific roles in the welfare effects of consumption fluctuations and growth. For instance, to the extent that a risk averse agent prefers a smooth consumption path, an increase in the risk averse parameter will imply a larger welfare cost of fluctuations. In addition, given that current shocks persist over all future periods, the total welfare cost of fluctuations is a discounted sum of static welfare

[4] Merton (1971) shows that consumption follows a random walk process in an intertemporal optimization framework. Empirical studies also support the random walk hypothesis (See, for example, Nelson and Plosser (1982); Cooley and Ogaki (1996); and Ogaki (1992)).

costs. Obstfeld (1994) shows that the discount rate of static welfare costs increases with IES.[5] As such, a higher IES would imply a larger total welfare cost of fluctuations for reasons that are not related to the risk aversion parameter. The standard CRRA utility function cannot account for such a specific role because it assumes that IES is the inverse of the risk aversion parameter, so a recursive utility formulation is more appropriate for welfare analysis in the presence of persistent shocks.

Assume the representative agent has the recursive preferences of Epstein and Zin (1989),

$$U_t = \left(C_t^{1-\theta} + \beta \left[E_t \left(U_{t+1}^{1-\gamma} \right) \right]^{\frac{1-\theta}{1-\gamma}} \right)^{\frac{1}{1-\theta}}, \tag{2}$$

which is increasing, concave, and homogenous of degree one in C_t; where β, $0 < \beta < 1$, is a constant discount factor; γ, $0 < \gamma \neq 1$; is the coefficient of relative risk aversion, and $1/\theta$, $0 < \theta \neq 1$, is IES for deterministic consumption paths.[6]

2.2 Welfare effects

Let $\lambda \equiv \lambda(\phi, \sigma^2, g)$ and $\zeta \equiv \zeta(\phi, \sigma^2, g)$ denote the welfare effects of consumption fluctuations and growth, respectively, where $\phi = (\phi_0 \; \phi_1 \; \ldots \phi_\ell)'$. As in Lucas (1987), λ represents the percentage increase in consumption, across all dates and states, required to leave the representative agent indifferent between consumption instability and a perfectly smooth consumption path. Alternatively, λ can be interpreted as the willingness to pay in order to eliminate all volatility in consumption or as representing the welfare gain that would be obtained if consumption were completely stabilized. In the same way, ζ measures the additional consumption, across all dates and states, that the representative agent would obtain if the trend growth g increases by one percent.[7]

The calculation of λ and ζ follows from the value function iteration method employed in Dolmas (1998).[8] Rewrite (2) as

[5] This result holds provided that the mean adjusted growth rate is positive. When the mean adjusted growth is negative the opposite relationship is true (see Obstfeld (1994)). In any case when shocks are persistent, IES affects welfare effects of consumption fluctuations and growth for reasons that are not related to the risk aversion parameter.

[6] Note that (2) reduces to the $CRRA$ utility function if $\gamma = \theta : U_t = E \sum_{j=0}^{\infty} \beta^j \frac{1}{1-\gamma} C_{t+j}^{1-\gamma}$.

[7] This benchmark of one percent long-term growth is used to make the results comparable with the literature (See, for example, Dolmas (1998), Lucas (1987), Obstfeld (1994), and Pallage and Robe (2003)).

[8] However, Dolmas (1998) assumes an $AR(1)$ consumption process. Moreover, when the autoregressive coefficients ϕ_i are restricted to zero Obstfeld (1994) derives close form solutions for λ and ζ.

$$v(c_t) = \left(1 + \beta \left[E\left(c_{t+1}v(c_{t+1}) \mid \underline{c}_t\right)^{1-\gamma}\right]^{\frac{1-\theta}{1-\gamma}}\right)^{\frac{1}{1-\theta}}, \tag{3}$$

where $c_t = \frac{C_t}{C_{t-1}}$; $\underline{c}_t = (c_t, \ldots, c_{t-\ell+1})$; $v(c_t)$ is a normalized value function defined as $C_t v(c_t) = V(C_t, c_t)$, with $V(C_t, c_t) \equiv U_t$. The stochastic consumption process in Eq. (1) is approximated by a finite state Markov chain process with the methodology proposed by Tauchen (1986). As such, the normalized value functions can be expressed in terms of discrete values of consumption growth $\{\overline{c}^1, \overline{c}^2, \ldots, \overline{c}^n\}$ across n states. Subsequently, the discrete normalized value functions are solved iteratively[9] until successive values differ by no more than 10^{-8}.

After solving for the normalized value functions, the welfare cost of consumption fluctuation gives[10]

$$\lambda = \frac{v_{\text{det}}}{v_{sto}} - 1, \tag{4}$$

where $v_{\text{det}} = \left[\frac{1}{1-\beta(1+g)^{1-\theta}}\right]^{\frac{1}{1-\theta}}$ is the normalized value function for deterministic consumption paths obtained by plugging the deterministic consumption growth g in Eq. (3), and v_{sto} is the corresponding value function for the stochastic consumption process. In particular, v_{sto} is estimated as the weighted average of the normalized value functions across the n states where the weights are the invariant probabilities π_j, $j = 1, \ldots, n$,. Formally:

$$v_{sto} = \sum_{j=1}^{n} \pi_j v(\overline{c}^j). \tag{5}$$

The welfare gain from growth is obtained in an analogous way:

$$\zeta = \frac{\sum_{j=1}^{n} \pi_i^g v(\overline{c}_g^j)}{\sum_{j=1}^{n} \pi_j v(\overline{c}^j)} - 1. \tag{6}$$

where π_j^g, $j = 1, \ldots, n$, is the invariant probability associated with the value function $v(\overline{c}_g^j)$ for state j (when the mean growth rate is increased by one percent).

There are two issues related to the finite state Markov chain approximation: the lag length in the AR process and the number of discrete states. With respect to the

[9] Under Blackwell (1965)' conditions, it can be shown that the value function iteration method yields a unique solution (see for instance Stokey et al. (1989) and Sargent and Ljungqvist (2000)).

[10] This expression is obtained under the assumption of homogeneity of the utility function.

lag length, a preliminary analysis of the data indicates that the fourth AR coefficient is not statistically different from zero at the 10 percent significance level for any country. Therefore, I start by estimating an $AR(3)$ process. If the third AR coefficient is not significant at 10 percent for a country the corresponding lag regressor is removed and the model is re-estimated. This procedure continues until an AR coefficient is significant at 10 percent. If no AR coefficient is significantly different from zero, I simply regress the growth rate on the constant term. In the case where the lag length is greater than one, the AR process is rewritten as a $VAR(1)$ model, which is also approximated by a finite state Markov chain process.[11] See Tauchen (1986) for technical details.

For the selection of the number of states, I follow the procedure used by Otrok et al. (2002). In particular, the number of discrete states is chosen such that the first four moments and the six auto-correlations of the Markov process match the ones of the continuous AR process. In general, I find a good approximation when the number of discrete states is set to $n = 19$ for the $AR(1)$ process and to $n = 5^{\ell}$ for the $VAR(1)$ process.[12]

2.3 Posterior distributions of welfare effects

This section discusses the proposed Bayesian inference on λ and ζ. For this purpose, it is assumed that only uncertainty related to the estimation of ϕ and σ^2 matter for inference on λ and ζ. Moreover, λ and ζ are complicated functions of ϕ and σ^2 such that the functional form of their posterior distributions cannot be directly obtained. To overcome this difficulty, a Markov Chain Monte Carlo ($MCMC$) method is used to simulate the posterior distributions of λ and ζ. At each step k, $k = 1, \ldots, K$, of the chain, $\phi^{(k)}$ and $\sigma^{2^{(k)}}$ are drawn from their posterior distributions, the functional forms of which are explicitly known. Subsequently, $\lambda^{(k)}$ and $\zeta^{(k)}$ are calculated with the methodology explained in Section 2.2. This procedure is repeated until convergence.

Given Eq. (1) the likelihood function, conditional on the $data = \{x; (g_0, \ldots, g_{\ell-1})\}$, is

$$L(\phi, \sigma^2 \mid data) = (2\pi\sigma^2)^{-\frac{T-\ell+1}{2}} \exp\left\{-\frac{1}{2\sigma^2}(x - X\phi)'(x - X\phi)\right\}, \tag{7}$$

[11] Otrok et al. (2002) use a similar approach. Chris Otrok also generously posts the approximation codes of the VAR(1) process on his web page http://people.virginia.edu/~cmo3h/

[12] Note that the number of total possible states for the $VAR(1)$ process has a general formula $n = n_1^{\ell}$ where n_1 is the number of grid points for each of the ℓ variables. For instance, $\ell = 2$ in the case of an $AR(2)$ process. Therefore, for each discrete value of variable 1, variable 2 can take any of the n_1 grid points.

where $(g_0, \ldots, g_{\ell-1})$ are treated as fixed initial conditions, $x = (g_\ell, \ldots, g_T)'$, $\varepsilon = (\varepsilon_\ell, \ldots, \varepsilon_T)'$, $\phi = (\phi_0\ \phi_1 \ldots \phi_\ell)'$ and X is a $(T - \ell + 1) \times (\ell + 1)$ matrix of ones and lagged observations on x. Eq. (7) implies that conditional on σ^2, ϕ has a normal distribution. In the same way, conditional on ϕ, σ^2 has an inverted Gamma distribution. Assuming natural conjugate priors for $\phi \mid \sigma^2$ and $\sigma^2 \mid \phi$,

$$\phi \mid \sigma^2 \sim N(\overline{\phi}, \Sigma_0) I_{s(\phi)} \text{ and } \sigma^2 \mid \phi \sim IG(\frac{\nu_0}{2}, \frac{\delta_0}{2}) \tag{8}$$

yields the following conditional posterior distributions

$$\phi \mid \sigma^2, data \sim N(\widetilde{\phi}, \Sigma_1) I_{s(\phi)}, \tag{9}$$

$$\sigma^2 \mid \phi, data \sim IG(\frac{\nu_1}{2}, \frac{\delta_1}{2}), \tag{10}$$

where $\widetilde{\phi} = (\overline{\phi} + \sigma^{-2} X'X)^{-1} (\Sigma_0^{-1} \overline{\phi} + \sigma^{-2} X'c)$, $\Sigma_1 = (\Sigma_0^{-1} + \sigma^{-2} X'X)$, $\nu_1 = \nu_0 + (T - \ell + 1)$, and $\delta_1 = \delta_0 + (x - X\phi)'(x - X\phi)$, with the following diffuse prior parametrization: $\Sigma_0 = 4000 I_\ell; \overline{\phi} = (0\ 0, \ldots, 0)'$ and $\nu_0 = \delta_0 = 0$. $I_{s(\phi)}$ is an indicator function that puts a zero prior mass on the region of the parameter space where draws on (ϕ, σ^2) are not stationary.[13] Moreover, draws that generate negative values or values that lie outside the unit circle for λ, and ζ are discarded. These restrictions derive from λ and ζ being able to be interpreted as shares of consumption that the agent is willing to pay for in order to eliminate fluctuations and to reduce growth, respectively.

Given the dependence between the posterior distributions of $\phi \mid \sigma^2$ and $\sigma^2 \mid \phi$, a Gibbs sampling method, which also belongs to the class of MCMC methods, is used. More formally, the algorithm used to estimate the conditional posterior distributions of ϕ, σ^2, λ, and ζ can be summarized as follows. After choosing a starting value $\phi^{(0)}$, the MCMC method generates a sequence of draws $\left\{\phi^{(k)}, \sigma^{2^{(k)}}, \lambda^{(k)}, \zeta^{(k)}\right\}$, $k = 1, \ldots, K$, in the following steps:

1. $\sigma^{2^{(k)}} \mid \phi^{(k-1)}$ is drawn from (10);

2. $\phi^{(k)} \mid \sigma^{2^{(k-1)}}$ is drawn from (9);

3. $\lambda^{(k)}$ and $\zeta^{(k)}$ are calculated with the methodology explained in Section 2.2. Moreover, $\lambda^{(k)} - \zeta^{(k)}$ is calculated at each iteration;

[13] Stationarity requires that the roots of the characteristic equation $(1 - \phi_1 z - \phi_2 z^2 - \ldots - \phi_\ell z^\ell = 0)$ lie outside the unit circle.

4. Repeat steps $1 - 3$ K times. The results reported in the paper are based on 2000 draws plus a burn-in phase of 200 replications (i.e. $K = 2200$).

I check convergence of the chain in two ways. First, I experimented with different numbers of draws ranging from 1000 to 2000 and the results remained qualitatively unchanged. Second, the Geweke (1991) test indicates that convergence cannot be rejected.[14]

3 Empirical analysis

3.1 Data

I use annual data on real private consumption per capita from 1960 to 2003. The data are expressed in constant dollars (international prices, base year 2000). They are taken from the Penn World Table, version 6.2 (Heston et al. (2006)). I restrict the analysis to a balanced data set on countries with at least grade C data quality.[15] This leads to a sample of 82 countries, 25 developed and 57 developing countries.[16]

Tables A1 and A2 in Appendix A report OLS estimation results for the AR consumption process. The data indicate that developing countries display larger shocks (large σ^2) to consumption than do developed countries. This result is consistent with findings in the literature (See, for example, Agenor et al. (2000) and Mendoza (1995)). However, the results in Tables A1 and A2 show a higher persistence of shocks in developed countries. Moreover, these results are in line with the findings of Giannone and Reichlin (2005) that consumption responses to technology shocks are more persistent in the Euro area than in the USA. In this paper, the persistence of shocks is measured by the largest root of the characteristic polynomial of the AR process (see Stock (1991)). Everything else being equal, a higher persistence of shocks will imply a larger welfare cost of consumption fluctuations. The reason is that the more persistent the shocks are, the more long-lasting their effects and the more welfare loss they will generate. As a result, it is interesting to see how the combination of the size and persistence of shocks affect the comparison of welfare effects across countries.

[14] The Geweke (1991) convergence test amounts to splitting the 2000 draws on each parameter into three consecutive equally sized sub-samples. Under the null hypothesis of convergence, the moments of the draws in the first and third sub-samples are equal. For the test, I concentrate on the first and second moments.

[15] Heston et al. (2006) provide information on the quality of the data of each country ranging from A to D with grade A representing the best quality.

[16] The classification between developed and developing countries is obtained from the World Developing Indicators (2010), where developed countries are defined as high income countries.

3.2 Main results

The entire empirical analysis assumes $\beta = 0.96$, which is the value often used in the literature for annual data. For the risk aversion parameter (γ) and IES ($1/\theta$), the results presented in this section are based on $\gamma = 5.0$ and $\theta = 1.5$, which are also the values commonly used in empirical macroeconomics. However, there is debate about the value of γ in the finance literature. Section 4 presents the results for higher values of γ and IES.

Tables 1 and 2 present the median together with the $5th$ and $95th$ quantiles of the posterior distributions of λ, ζ and $\lambda - \zeta$.

Table 1: **Posterior quantiles of welfare effects in developed countries**

	λ (%)			ζ (%)			λ (%) $-$ ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Australia	.89	1.24	1.81	18.59	19.45	20.42	−19.10	−18.20	−17.23
Austria	2.10	4.74	20.12	17.26	18.83	22.84	−16.59	−14.14	−1.66
Belgium	2.79	8.68	47.72	17.80	20.40	31.57	−16.72	−11.84	18.37
Canada	1.63	2.83	6.33	18.21	19.77	21.54	−18.57	−16.87	−13.39
Denmark	2.05	2.92	4.46	19.50	20.94	22.63	−19.51	−17.98	−16.30
Finland	3.54	5.12	7.87	17.23	18.86	20.88	−15.59	−13.68	−11.09
France	1.90	4.09	17.34	17.54	19.27	23.38	−17.38	−15.12	−4.39
Greece	5.63	14.20	55.55	16.10	18.85	26.53	−12.14	−4.58	31.19
Greece	2.90	4.08	6.07	16.10	17.42	18.97	−14.87	−13.33	−11.32
Iceland	12.87	23.17	54.46	17.02	20.14	26.20	−5.92	2.76	30.65
Ireland	4.31	8.57	25.40	16.72	18.86	23.16	−14.34	−10.27	4.99
Israel	4.07	6.29	11.42	17.05	18.32	20.11	−14.22	−12.06	−7.42
Italy	3.25	8.11	44.01	17.20	19.62	29.74	−15.50	−11.42	15.73
Japan	8.54	23.49	78.95	16.67	20.96	32.57	−9.72	2.72	46.76
Korea	5.55	8.13	12.67	13.75	15.28	17.33	−9.53	−7.12	−3.36
New Zealand	2.86	5.01	12.25	20.19	22.09	24.85	−19.42	−17.00	−10.76
Norway	2.00	2.92	4.42	17.63	18.89	20.41	−17.40	−15.98	−14.39
Portugal	9.90	19.72	52.74	16.07	19.37	25.94	−8.10	.23	29.08
Spain	4.54	10.27	36.27	16.87	19.59	26.77	−14.27	−9.37	10.65
Sweden	2.52	4.93	14.59	19.30	21.47	25.17	−19.17	−16.40	−8.23
UK	2.01	3.72	10.18	17.66	19.12	21.34	−17.23	−15.35	−9.66
USA	1.16	2.07	5.33	17.45	18.61	20.14	−17.80	−16.49	−13.39

The results indicate large uncertainty on estimates of the welfare cost of consumption fluctuations. For example, looking at the USA results, the 90 percent credible interval for λ is $[1.16; 5.33]$ percent of consumption. Using identical preference parameter values, Pallage and Robe (2003) find a 2.11 percent point estimate for λ. However, the credible interval for λ suggests considerable uncertainty around this value. In international dollar terms—taking the USA average annual real per capita consumption to be \$15790.30 for

Table 2: **Posterior quantiles of welfare effects in developing countries**

	λ (%)			ζ (%)			λ (%) $-$ ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Argentina	15.86	25.17	43.95	21.00	26.01	33.88	−8.22	−0.87	12.97
Barbados	16.24	25.72	46.03	19.69	24.20	31.99	−6.48	1.58	15.97
Benin	8.75	13.29	21.93	20.11	23.44	28.09	−14.24	−10.29	−3.76
Burkina Faso	8.20	12.32	20.36	20.59	24.02	28.88	−15.64	−11.51	−5.88
Bolivia	6.42	11.57	30.17	22.13	25.00	30.87	−18.28	−13.50	1.13
Brazil	8.53	12.64	20.94	16.46	18.86	22.32	−9.90	−6.16	0.01
Burundi	31.78	53.50	89.10	23.26	31.49	44.19	5.15	21.68	48.91
Cameroon	24.67	50.33	92.10	21.48	28.06	39.04	0.10	22.13	58.26
Chile	30.09	51.07	87.03	17.70	23.36	31.93	10.44	27.63	57.65
China	5.67	10.76	28.99	13.43	15.34	18.96	−8.92	−4.68	11.13
Cote d'Ivoire	14.57	22.52	38.33	20.03	24.39	31.68	−8.52	−1.74	9.53

$1960-2003$—these estimates correspond to a welfare cost of about $[183;843]$ per person and per year in $1960-2003$. Thus, while the literature shows conflicting point estimates for λ across different models, estimates obtained from a particular model display considerable uncertainty. As such, one should account for this uncertainty when comparing ζ with λ. Results for other countries show even greater uncertainty. For instance, the credible intervals for λ in France and Morocco are, respectively $[1.90;16.77]$ and $[10.02;42.52]$ percent of consumption. Given this large uncertainty, one should be very careful in interpreting the point estimates reported in earlier studies. Note, however, that estimates of ζ display relatively less uncertainty.

In order to compare estimates of λ and ζ between developed and developing countries, I calculate the unweighted average of posterior quantiles in each group. This yields the following 90 percent credible intervals for λ in developed and developing countries, respectively $[4.0;24.95]$ and $[17.73;51.26]$ percent. The corresponding figures for ζ are $[17.42;23.98]$ and $[19.85;31.14]$. These estimates imply that, while the welfare costs of consumption fluctuations are on average two to four times larger in developing countries than in developed countries the welfare effects of growth are only marginally larger in the former than in the latter.

Comparing the results among developing countries reveals that Sub-Saharan Africa and oil producing countries of the Middle East would gain most from further consumption stabilization, followed by South and Latin American countries and Asian countries. The difference in the magnitude of the welfare cost of fluctuations is mainly due to the size of the shocks. In line with this explanation, oil-producing countries (such as Nigeria, Congo,

Table 2: **Posterior quantiles of welfare effects in developing countries** (Continued)

	λ (%)			ζ (%)			λ (%) $-$ ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Colombia	5.17	12.41	52.82	20.03	23.35	32.32	−16.89	−10.97	21.54
Congo	49.89	78.46	97.69	23.09	31.14	40.56	23.55	46.24	63.76
Costa Rica	8.58	16.37	46.00	19.00	22.76	29.87	−13.48	−6.32	18.60
Dominican, Rep.	20.85	33.18	62.36	16.79	20.67	28.38	2.20	12.52	36.00
Ecuador	5.20	10.23	33.01	19.41	22.36	28.68	−17.03	−11.82	6.55
Egypt	5.64	8.31	12.88	17.35	19.36	22.09	−13.77	−11.04	−7.09
El Salvador	12.72	27.55	75.23	19.67	25.10	36.57	−10.35	2.21	41.89
Ethiopia	20.47	34.92	69.64	20.07	25.13	34.30	−2.19	9.73	37.60
Gabon	51.38	78.85	97.80	18.82	24.47	31.84	30.39	53.61	70.96
Gambia	52.89	80.23	97.76	22.40	29.55	37.94	27.55	49.82	66.33
Ghana	25.59	42.36	78.06	24.43	32.53	46.67	−2.89	9.92	34.32
Guatemala	5.06	13.44	64.51	21.71	25.78	39.52	−19.35	−12.03	26.71
Guinea	7.44	10.91	17.43	21.61	24.72	29.20	−17.45	−13.83	−8.91
Hong Kong	9.29	18.69	52.10	13.86	16.44	22.00	−5.86	2.28	32.46
Honduras	5.56	8.05	12.37	20.94	23.52	26.93	−18.49	−15.41	−11.60
India	3.66	5.26	8.04	18.19	19.92	22.13	−16.74	−14.63	−12.17
Indonesia	8.39	15.88	43.04	14.80	17.30	22.51	−8.01	−1.42	21.87
Iran	29.91	49.83	87.11	20.31	26.60	36.64	7.25	22.83	52.84
Jamaica	18.64	36.44	84.53	21.73	28.26	41.53	−6.77	8.41	46.19
Jordan	47.10	77.75	97.70	23.32	31.45	42.70	19.53	44.87	65.79
Kenya	19.08	32.58	66.05	24.71	30.94	42.71	−9.55	1.32	27.49
Luxembourg	1.50	2.12	3.14	17.19	18.22	19.39	−17.24	−16.08	−14.78
Madagascar	8.51	12.72	20.67	27.91	33.03	41.08	−25.70	−20.22	−14.34
Malawi	7.74	11.90	20.99	18.94	21.56	25.48	−13.54	−9.74	−2.06
Malaysia	11.91	22.61	60.04	15.84	19.13	25.82	−5.81	3.53	35.30
Mali	15.17	24.63	47.43	20.63	24.80	32.08	−7.87	−0.32	17.49
Mauritius	28.89	47.55	85.40	16.11	20.94	28.96	11.07	26.38	57.67
Mexico	6.18	10.87	28.35	18.66	21.63	26.78	−15.19	−10.53	3.20
Morocco	10.02	17.74	42.52	18.94	22.01	28.07	−10.76	−4.12	15.97
Nepal	3.05	4.53	7.42	20.70	22.48	24.79	−19.90	−18.00	−15.14
Netherlands	3.09	6.01	15.94	17.64	19.63	22.99	−16.65	−13.68	−4.49
Nigeria	47.23	75.45	97.55	25.66	33.02	42.52	18.63	41.76	61.50
Pakistan	6.88	10.10	15.88	17.50	19.81	22.98	−12.87	−9.75	−5.08
Panama	12.59	20.01	35.57	18.01	21.00	25.90	−7.28	−0.96	11.91
Paraguay	8.66	12.77	20.38	18.30	21.12	25.24	−12.19	−8.37	−2.52
Peru	17.92	28.90	51.77	19.12	23.71	31.91	−3.47	5.12	22.78
Philippines	2.36	4.15	9.37	19.30	20.87	22.89	−18.83	−16.71	−11.91
Rwanda	44.38	70.74	96.09	21.89	29.49	39.41	18.96	40.40	62.62
South Africa	3.68	7.38	23.26	19.44	21.96	26.87	−18.22	−14.53	−1.62
Senegal	8.87	13.29	21.69	23.31	27.44	33.42	−18.49	−14.11	−8.15
Sri Lanka	8.07	11.96	19.29	16.22	18.60	21.75	−10.20	−6.54	−0.90
Switzerland	1.80	4.17	15.54	19.74	21.89	26.29	−20.20	−17.62	−8.24
Syria	49.30	76.55	97.74	18.24	23.40	29.62	28.96	52.32	72.28
Tanzania	6.21	11.90	35.46	22.51	25.58	31.90	−19.03	−13.50	5.11
Thailand	5.91	11.02	33.49	15.15	17.36	21.60	−10.94	−6.28	12.25
Trinidad	25.45	41.54	77.44	18.17	23.30	32.31	5.32	18.24	47.56
Uruguay	16.85	31.53	76.46	20.84	25.40	34.04	−6.72	6.40	44.02
Venezuela	23.70	48.05	90.58	20.80	27.67	39.65	−0.55	20.01	55.08
Zambia	47.86	75.82	97.50	25.74	34.67	46.82	17.99	39.57	59.78
Zimbabwe	64.43	87.93	98.90	19.98	25.59	32.32	41.29	61.25	72.77

Table 3: **Summary results**

Developed			Developing		
Growth	**Stabilization**	**Inconclusive**	**Growth**	**Stabilization**	**Inconclusive**
Australia		Belgium	Benin	Burundi	Argentina
Austria		Greece	Brazil	Chile	Barbados
Canada		Hong Kong	Burkina Faso	Congo	Bolivia
Denmark		Iceland	Egypt	Dominican, Rep.	Cameroon
Finland		Ireland	Guinea	Gabon	China
France		Italy	Honduras	Gambia	Colombia
Israel		Japan	India	Iran	Costa Rica
Korea		Portugal	Madagascar	Jamaica	Cote d'Ivoire
Luxembourg		Spain	Malawi	Jordan	Ecuador
Netherlands			Nepal	Mauritius	El Salvador
New Zealand			Pakistan	Nigeria	Ethiopia
Norway			Paraguay	Rwanda	Ghana
Sweden			Philippines	Syria	Guatemala
Switzerland			Senegal	Trinidad & Tobago	Indonesia
UK			South Africa	Zambia	Kenya
USA			Sri Lanka	Zimbabwe	Malaysia
					Mali
					Mexico
					Morocco
					Panama
					Peru
					Tanzania
					Thailand
					Uruguay
					Venezuela

Gabon, Jordan, Iran, Syria, and Cameroon) and countries that experienced wars and political crises (e.g. Burundi, Rwanda, Zimbabwe) are the ones that would benefit the most from consumption stabilization. Across developed countries, the following countries would also gain relatively more from consumption stabilization: Hong Kong, Iceland, Ireland, Italy, Japan, Greece, Portugal, and Spain. Compared to other developed countries these countries are characterized by larger consumption fluctuations and highly persistent shocks. Developed countries such as Australia, Luxembourg, and the USA would gain relatively less from further consumption stabilization.

Let us now compare the welfare gain from consumption stabilization with the welfare gain from long-term growth as in Lucas' original exercise.[17] The last three columns of

[17]Note that this comparison does not take into account the cost of implementing policies. Moreover, it might not be feasible to remove all fluctuations in consumption or to achieve an increase in long-term growth by one percent in a country.

Tables 1 and 2 report posterior quantiles on $\lambda - \zeta$. Table 3 summarizes results in these three last columns by classifying countries into three categories: *i*) growth when the 90 credible interval for $\lambda - \zeta$ has negative bounds; *ii*) stabilization when it has positive bounds; and *iii*) inconclusive when it includes zero.

Two main findings can be derived from Table 3. First, the welfare comparison is inconclusive in 34 developed and developing countries, amounting to 42 percent of the sample size. This is very high. Moreover, the rate of inconclusiveness is somehow higher in developing countries (44 percent) than in developed countries (36 percent). Second, when the welfare comparison yields conclusive results, all of the developed countries would gain more from growth than from stabilization. In the case of developing countries, one half of the countries would benefit from growth and the other half from stabilization. These findings suggest the need for caution in interpreting point estimates reported in the literature, especially as regards developing countries.

4 Sensitivity and sub-period analysis

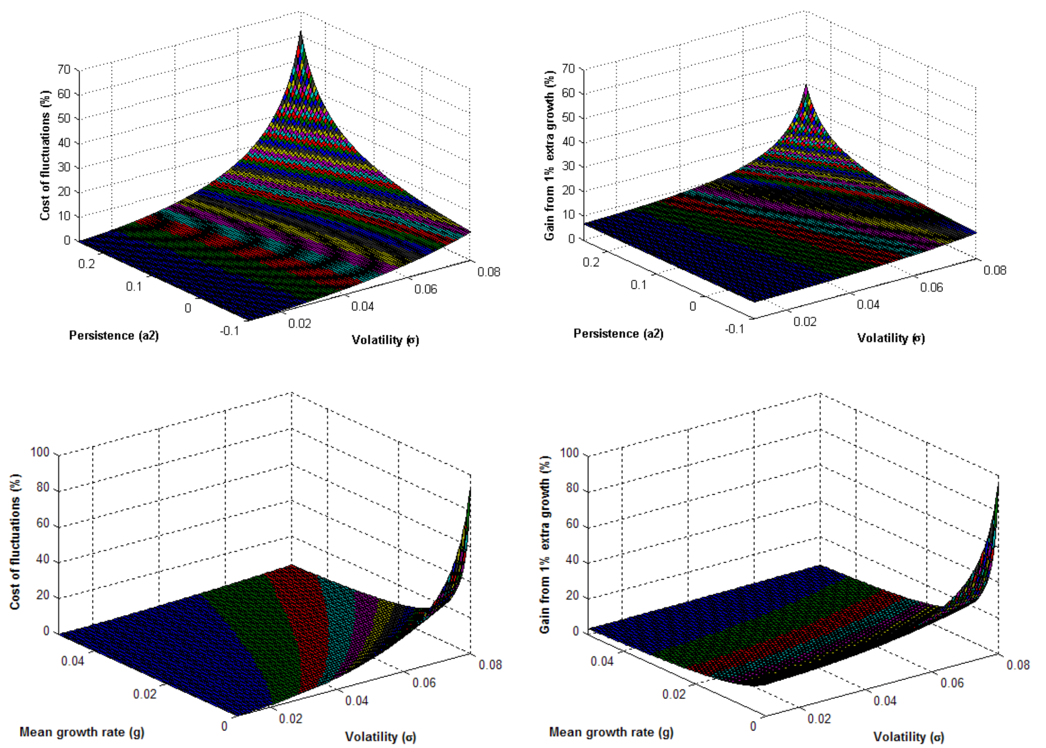
This section presents sensitivity analysis with respect to the risk aversion parameter (γ) and IES ($1/\theta$). Moreover, a sub-period analysis is provided in order to account for a possible parameter instability of the AR process. Before presenting the results I first examine how γ, θ and the parameters of the AR process affect λ and ζ. Table 4 displays medians of the posterior distribution of λ and ζ in France for various combinations of γ and θ in the set $\{1.5, 2.0, 2.5, 5.0\}$.

Table 4: **Median posterior welfare effects in France**

	λ (%)				ζ (%)			
	$\theta = 1.5$	$\theta = 2$	$\theta = 2.5$	$\theta = 5$	$\theta = 1.5$	$\theta = 2$	$\theta = 2.5$	$\theta = 5$
$\gamma = 1.5$	.73	.59	.50	.31	18.78	14.57	11.87	6.04
$\gamma = 2$	1.20	.96	.81	.46	18.85	14.63	11.93	6.09
$\gamma = 2.5$	1.68	1.34	1.11	.60	18.92	14.72	12.02	6.14
$\gamma = 5$	4.09	3.26	2.69	1.36	19.27	15.13	12.41	6.40

For a given value of θ, λ increases with the coefficient of relative risk aversion, γ. This relationship reflects the preference for a smooth consumption path for risk-averse consumers. As a result, the more risk averse a person is, the more welfare compensation he would require in order to eliminate fluctuations in consumption. Alternatively, with γ held constant, λ decreases with θ. This result captures the positive impact of IES (i.e.

Figure 1: **The role of persistence, volatility and growth on welfare effects**



Notes: Figures obtained with an $AR(2)$ process and $\gamma = 2.5$; $\theta = 5$. The top panel assumes $\phi_1 = .20$ and the value of ϕ_2 is allowed to vary between $-.1$ and $.25$. Moreover, $g = 1.6$ percent.

$1/\theta$) on the welfare cost of consumption fluctuations in the presence of persistent shocks. In particular, when shocks are persistent, the discount factor of static welfare costs of consumption fluctuations over time increases with IES.[18]

In order to have a better understanding of the impacts of the parameters of the AR process (σ^2, ϕ_i, g) on λ and ζ, I consider artificial countries, each characterized by different parametrization of an $AR(2)$ consumption process. Figure 1, which reports the implied values of λ and ζ, shows that the welfare cost of fluctuations increases with both the size and the persistence of shocks.

The larger the shocks, the more consumers find them costly and the more they will be willing to pay in order to have a smooth consumption path. In addition, the more persistent the shocks the more long lasting will be their effects and the more welfare loss they will generate. By contrast, the welfare loss of fluctuations is high for low values of the long-term growth rate. This result suggests that volatility hits poor consumers

[18] This result holds provided that the mean adjusted growth rate (i.e. $g - \frac{1}{2}\gamma\sigma^2$) is positive. When the mean adjusted growth is negative the opposite relationship is true (see Obstfeld (1994)).

harder than the rich. In particular, volatility has a very large welfare detrimental effect on consumers that are close to subsistence.

Table 5: **Summary results with higher risk aversion**

Developed			**Developing**		
Growth	**Stabilization**	**Inconclusive**	**Growth**	**Stabilization**	**Inconclusive**
Australia	Iceland	Austria	India	Argentina	Benin
Canada	Portugal	Belgium	Nepal	Barbados	Burkina Faso
Denmark	Hong Kong	France		Burundi	Bolivia
Finland		Greece		Cameroon	Brazil
Norway		Ireland		Chile	China
USA		Israel		Cote d'Ivoire	Colombia
Luxembourg		Italy		Congo	Costa Rica
		Japan		Dominican, Rep.	Ecuador
		Korea		El Salvador	Egypt
		New Zealand		Ethiopia	Guatemala
		Spain		Gabon	Guinea
		Sweden		Gambia	Honduras
		UK		Ghana	Madagascar
		Netherlands		Indonesia	Malawi
		Switzerland		Iran	Mexico
				Jamaica	Morocco
				Jordan	Pakistan
				Kenya	Paraguay
				Mali	South Africa
				Mauritius	Senegal
				Nigeria	Sri Lanka
				Panama	Tanzania
				Peru	Thailand
				Rwanda	Uruguay
				Syria	
				Trinidad	
				Venezuela	
				Zambia	
				Zimbabwe	

4.1 Higher risk aversion level and IES

There is dispute about the empirical values of γ and θ.[19] Due to this debate this section analyzes the impact of doubling the risk aversion (γ) and IES ($1/\theta$). In particular, I

[19] For instance, Ogaki et al. (1996) find estimated values for θ ranging from 2.26 to 2.96 for low-income countries; from 1.32 to 2.51 for lower-middle-income countries; from 1.26 to 2.38 for upper middle income countries; and from 1.21 to 2.29 for high income countries. Hall (1988) argues that "the elasticity is unlikely to be much above 0.1, and may well be zero" in the USA. Campbell and Mankiw (1989) estimate a value of about 3 for the UK. For the risk aversion parameter, Mehra and Prescott (1985) and Kandel

reestimate welfare effects under the following two preferences parametrizations: *i)* $\gamma = 10$ and $\theta = 1.5$; and *ii)* $\gamma = 5$ and $\theta = .75$. Tables 5 and 6 report summary results analogous to Table 3. See Appendices B and C for the detailed results.

Table 6: **Summary results with higher IES**

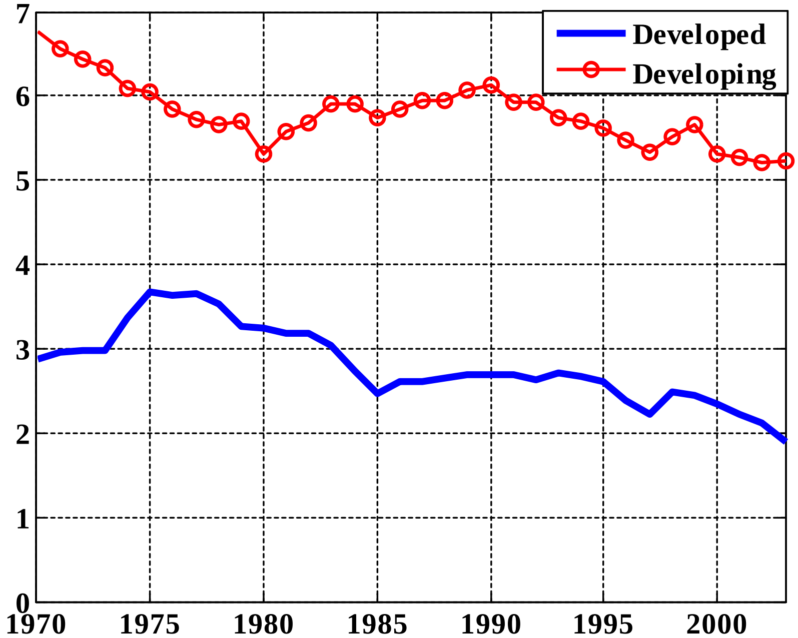
Developed			**Developing**		
Growth	**Stabilization**	**Inconclusive**	**Growth**	**Stabilization**	**Inconclusive**
Australia		Austria	Benin	Burundi	Argentina
Canada		Belgium	Burkina Faso	Cameroon	Barbados
Denmark		Greece	Egypt	Chile	Bolivia
Finland		Hong Kong	Guinea	Congo	Brazil
France		Iceland	Honduras	Dominican, Rep.	China
Israel		Ireland	India	Gabon	Cote d'Ivoire
Korea		Italy	Madagascar	Gambia	Colombia
Luxembourg		Japan	Malawi	Iran	Costa Rica
Netherlands		Portugal	Nepal	Jordan	Ecuador
New Zealand		Spain	Pakistan	Mauritius	El Salvador
Norway			Paraguay	Nigeria	Ethiopia
Sweden			Philippines	Rwanda	Ghana
Switzerland			Senegal	Syria	Guatemala
UK			South Africa	Trinidad & Tobago	Indonesia
USA			Sri Lanka	Zambia	Jamaica
				Zimbabwe	Kenya
					Malaysia
					Mali
					Mexico
					Morocco
					Panama
					Peru
					Tanzania
					Thailand
					Uruguay
					Venezuela

Doubling the risk aversion level leads to a marginal increase of inconclusive cases (39 versus 34 countries). However, the new inconclusive cases primarily concern developed countries (15 versus 9). Doubling the risk aversion level also has other effects. For instance, Iceland, Portugal and Hong Kong shift from inconclusive to stabilization. In the same way, Egypt moves from growth to inconclusive. These re-classifications that occur following increase in risk aversion constitute another aspect of uncertainty of the results.

and Stambaugh (1991) argue that values as high as 30 cannot be ruled out. One problem with these estimates is that they are based on the CRRA utility function in which the risk aversion is the inverse of IES.

By contrast, doubling IES does not change the classification of developed countries. The results for developing countries also do not change except for two cases: Brazil moves from growth to inconclusive, and Cameroon switches from inconclusive to stabilization.

Figure 2: **Rolling standard deviation of consumption growth**



Note: The value for 1970 is the standard deviation of per capita growth rates for the period $1961 - 1970$. The value for 1971 refers to $1962 - 1971$, etc.

4.2 Sub-period Analysis

Finally, this section repeats the welfare comparison analysis on two different sub-periods. The motivation for the sub-period analysis is to account for structural breaks in the data. For instance, the literature identifies a decline of fluctuations in many countries from the mid-1980s. This phenomenon is referred to as the great moderation. Figure 2, which plots the cross-country unweighted average values of 10-year rolling estimates of the standard deviation of real consumption per capita growth, illustrates this. However, the data show that consumption volatility is still much higher in developing countries compared to their developed counterparts. In order to investigate the impact of the great moderation on the welfare comparison the following two sub-periods are considered: $1960 - 1985$ and $1986 - 2003$.[20] For each of the sub-periods, I again carry out the lag-selection exercise and estimate the posterior distribution of λ and ζ assuming $\gamma = 5$ and $\theta = 1.5$. Tables 7 and 8 report summary results analogous to Table 3. See Appendices D and E for the detailed results.

Table 7: **Summary results: 1960-1985**

Developed			Developing		
Growth	**Stabilization**	**Inconclusive**	**Growth**	**Stabilization**	**Inconclusive**
Australia	Austria	Belgium	Nepal	Brazil	Argentina
Korea	Canada	Denmark		Cameroon	Barbados
New Zealand	Finland	France		Chile	Benin
Switzerland	Hong Kong	Greece		Cote d'Ivoire	Burkina Faso
UK	Norway	Iceland		Dominican. Rep.,	Bolivia
	Portugal	Ireland		Egypt	Burundi
		Israel		El Salvador	China
		Italy		Gabon	Colombia
		Japan		India	Congo
		Luxembourg		Indonesia	Costa Rica
		Netherlands		Jordan	Ecuador
		Spain		Kenya	Ethiopia
		Sweden		Malaysia	Gambia
		USA		Mauritius	Ghana
				Morocco	Guatemala
				Nigeria	Guinea
				Pakistan	Honduras
				Paraguay	Iran
				Peru	Jamaica
				Sri Lanka	Madagascar
				Syria	Malawi
				Thailand	Mali
				Trinidad & Tobago	Mexico
				Venezuela	Panama
				Zimbabwe	Philippines
					Rwanda
					South Africa
					Senegal
					Tanzania
					Uruguay
					Zambia

[20] The break year of 1985 is also considered in other cross-country studies (See, for example, Kose et al. (2005))

Table 8: **Summary Results: 1986-2003**

Developed			Developing		
Growth	**Stabilization**	**Inconclusive**	**Growth**	**Stabilization**	**Inconclusive**
Austria		Australia	Benin	Ethiopia	Argentina
Belgium		Denmark	Bolivia	Gambia	Barbados
Canada		Greece	Brazil	Jordan	Burkina Faso
Finland		Hong Kong	Chile	Mali	Burundi
France		Ireland	Ecuador	Nigeria	Cameroon
Iceland		Japan	Egypt	Peru	China
Israel		Korea	Guatemala	Rwanda	Cote d'Ivoire
Italy		Netherlands	Honduras	Syria	Colombia
Luxembourg		New Zealand	India	Trinidad & Tobago	Congo
Norway		Portugal	Mauritius	Zambia	Costa Rica
Switzerland		Spain	Pakistan	Zimbabwe	Dominican, Rep.
USA		Sweden	Philippines		El Salvador
		UK	Senegal		Gabon
			Sri Lanka		Ghana
					Guinea
					Indonesia
					Iran
					Jamaica
					Kenya
					Madagascar
					Malawi
					Malaysia
					Mexico
					Morocco
					Nepal
					Panama
					Paraguay
					South Africa
					Tanzania
					Thailand
					Uruguay
					Venezuela

The results suggest that the time period under study plays an important role. Taking Belgium as an example, the credible interval for $\lambda - \zeta$ includes zero in the first sub-period while it has negative bounds in the second sub-period. This result could be explained by the fact that Belgium faced relatively smaller shocks in the second sub-period. In addition, the persistence of shocks has decreased in the second sub-period for Belgium. As a result, the welfare cost of fluctuations decreased in relative terms across the two periods. Overall, the welfare comparison differs across the two sub-periods. Moreover, the sub-sample analysis shows more inconclusive cases, especially for developing countries.

These findings indicate larger uncertainty on earlier estimates obtained with small sample period data.

5 Conclusion

This paper has proposed a framework for inference on welfare effects of consumption fluctuations and growth. The literature has thus far produced only point estimates. Moreover, the empirical analysis here examines data from 82 developed and developing countries while most existing studies focus on the USA. In addition, the data cover a relatively long time period ($1960 - 2003$), and it is shown how the results evolve across sub-periods.

The results show large credible intervals on the welfare cost of consumption fluctuations, which suggests great uncertainty as regards previously reported point estimates. Thus, while the literature shows conflicting point estimates of welfare effects across different models, this paper finds that estimates obtained from a particular model economy can display considerable uncertainty. As such, one should account for this uncertainty in the comparison between the welfare gain from consumption stabilization and the welfare gain from growth. Credible intervals for the difference between the welfare gain from consumption stabilization and the welfare gain from growth include zero in many developed and developing countries. Sub-period and sensitivity analysis support these results. These findings suggest the need for caution in drawing strong policy conclusions from point estimates.

The framework proposed in this paper can be extended to account for uncertainty about the risk aversion parameter and IES implied by data on consumption.

References

Agenor, P.-R., McDermott, J., Prasad, E., 2000. Macroeconomic fluctuations in developing countries: Some stylized facts. World Bank Economic Review 14 (2), 251–285.

Aghion, P., Saint-Paul, G., 1998a. Virtues of bad times interaction between productivity growth and economic fluctuations. Macroeconomic Dynamics 2 (3), 322–344.

Aghion, P., Saint-Paul, G., 1998b. Uncovering some causal relationships between productivity growth and the structure of economic fluctuations: A tentative survey. LABOUR 12 (3), 279–303.

Atkeson, A., Phelan, P., 1994. Reconsidering the costs of business cycles with incomplete markets. NBER Working Papers 4719, National Bureau of Economic Research.

Barlevy, G., September 2004. The cost of business cycles under endogenous growth. American Economic Review 94 (4), 964–990.

Barlevy, G., 2005. The cost of business cycles and the benefits of stabilization. Economic Perspectives 29 (1), 32–49.

Blackburn, K., 1999. Can stabilization policy reduce long-run growth? Economic Journal 109 (452), 67–77.

Blackwell, D., 1965. Discounted dynamic programming. The Annals of Mathematical Statistics 36 (1), 226–235.

Caballero, R., Hammour, M., 1994. The cleansing effect of recessions. American Economic Review 84 (5), 1350–68.

Campbell, J. Y., Mankiw, N. G., 1989. Consumption, income and interest rates: Reinterpreting the time series evidence. In: NBER Macroeconomics Annual 1989, Volume 4. NBER Chapters. National Bureau of Economic Research, pp. 185–246.

Cooley, T. F., Ogaki, M., 1996. A time series analysis of real wages, consumption, and asset returns. Journal of Applied Econometrics 11 (2), 119–34.

Dolmas, J., 1998. Risk preferences and the welfare cost of business cycles. Review of Economic Dynamics 1 (2), 646–676.

Epstein, L. G., Zin, S. E., 1989. Substitution, risk aversion, and the temporal behavior of consumption and asset returns: A theoretical framework. Econometrica 57 (4), 937–69.

Francois, P., Lloyd-Ellis, H., Sep. 2006. Growth, cycles and welfare: A schumpeterian perspective. Working Papers 1090, Queen's University, Department of Economics.

Geweke, J., 1991. Evaluating the accuracy of sampling-based approaches to the calculation of posterior moments. Staff Report 148, Federal Reserve Bank of Minneapolis.

Giannone, D., Reichlin, L., 2005. Euro area business cycle: Stylized facts and measurement issues. In: Reichlin, L. (Ed.), Euro Area and US Recessions, 1970-2003. C.E.P.R. London, pp. 83–93.

Hall, R. E., 1988. Intertemporal substitution in consumption. Journal of Political Economy 96 (2), 339–57.

Heston, A. R., Summers, R., Aten, B., 2006. Penn world table version 6.2. Tech. rep., Center for International Comparisons at the University of Pennsylvania (CICUP).

Imrohoroglu, A., 2008. welfare costs of business cycles. In: Durlauf, S. N., Blume, L. E. (Eds.), The New Palgrave Dictionary of Economics. Palgrave Macmillan, Basingstoke.

Imrohoruglu, A., December 1989. Cost of business cycles with indivisibilities and liquidity constraints. Journal of Political Economy 97 (6), 1364–83.

Kandel, S., Stambaugh, R. F., 1991. Asset returns and intertemporal preferences. Journal of Monetary Economics 27 (1), 39–71.

Kose, M. A., Prasad, E. S., Terrones, M. E., 2005. Growth and volatility in an era of globalization. IMF Staff Papers 52 (si), 31–63.

Krusell, P., Smith, A. A. J., 1999. On the welfare effects of eliminating business cycles. Review of Economic Dynamics 2 (1), 245–272.

Lucas, R. E. J., 1987. Models of Business Cycles. Basil Blackwell. Yrjo Jahnsson Lectures. New York.

Lucas, R. E. J., 2003. Macroeconomic priorities. The American Economic Review 93 (2), 1–14.

Martin, P., Rogers, C. A., 1997. Stabilization policy, learning-by-doing, and economic growth. Oxford Economic Papers Vol. 49 (2), 152–66.

Mehra, R., Prescott, E. C., 1985. The equity premium: A puzzle. Journal of Monetary Economics 15 (2), 145–161.

Mendoza, E. G., 1995. The terms of trade, the real exchange rate, and economic fluctuations. International Economic Review 36 (1), 101–37.

Merton, R. C., 1971. Optimum consumption and portfolio rules in a continuous-time model. Journal of Economic Theory 3 (4), 373–413.

Nelson, C. R., Plosser, C. I., 1982. Trends and random walks in macroeconomic time series: Some evidence and implications. Journal of Monetary Economics 10 (2), 139–162.

Obstfeld, M., 1994. Evaluating risky consumption paths: The role of intertemporal substituability. European Economic Review 37 (5), 1471–1486.

Ogaki, M., 1992. Engel's law and cointegration. Journal of Political Economy 100 (5), 1027–46.

Ogaki, M., Reinhart, C., Ostry, J., 1996. Saving behavior in low- and middle-income developing countries: A comparison. IMF Staff Papers 43(1), 38–71.

Otrok, C., 2001. On measuring the welfare cost of business cycles. Journal of Monetary Economics 47 (1), 61–92.

Otrok, C., Ravikumar, B., Whiteman, C. H., 2002. Evaluating asset-pricing models using the hansen-jagannathan bound: a monte carlo investigation. Journal of Applied Econometrics 17 (2), 149–174.

Pallage, S., Robe, M. A., 2003. On the welfare cost of economic fluctuations in developing countries. International Economic Review 44 (2), 677–698.

Ramey, G., Ramey, V. A., 1991. Technology commitment and the cost of economic fluctuations. NBER Working Papers 3755, National Bureau of Economic Research.

Sargent, T., Ljungqvist, L., 2000. Recursive Macroeconomic Theory, 2nd Edition. MIT Press.

Stock, J. H., 1991. Confidence intervals for the largest autoregressive root in u.s. macroeconomic time series. Journal of Monetary Economics 28 (3), 435–459.

Stokey, N. L., Lucas, R. E. J., Prescott, E. C., 1989. Recursive Methods in Economic Dynamics. Harvard University Press.

Tallarini, J. D., 2000. Risk-sensitive real business cycles. Journal of Monetary Economics 45 (3), 507–532.

Tauchen, G., 1986. Finite state markov-chain approximations to univariate and vector autoregressions. Economics Letters 20 (2), 177–181.

The World Bank, 2004. Strategic Framework for Assistance to Africa: IDA and the Emerging Partnership Model. Africa Region, Washington DC.

Van Wincoop, E., 1994. Welfare gains from international risk sharing. Journal of Monetary Economics 34 (2), 175–200.

A OLS estimation of the AR process

Table A1: **OLS estimates of the AR process in developed countries**

	ϕ_0		ϕ_1		ϕ_2		ϕ_3		Lar	g (%)	σ (%)
Australia	.02***	(.00)							.00	2.12	1.60
Austria	.02***	(.01)	.11	(.16)	.29**	(.16)			.60	2.72	1.90
Belgium	.01	(.01)	.33**	(.15)	−.06	(.16)	.43***	(.15)	.85	2.13	1.52
Canada	.02***	(.00)	.25*	(.14)					.25	2.09	1.88
Denmark	.02***	(.00)							.00	1.60	2.38
Finland	.03***	(.01)							.00	2.67	3.30
France	.01***	(.00)	.60***	(.13)					.60	2.42	1.38
Greece	.02***	(.01)	.22	(.15)	.33***	(.15)			.69	3.19	2.73
Hong Kong	.03***	(.01)	.34**	(.15)					.34	4.98	4.83
Iceland	.03***	(.01)	.27*	(.15)	−.29**	(.15)			.54	3.29	5.75
Ireland	.02***	(.01)	.42***	(.14)					.42	2.87	2.72
Israel	.05***	(.01)	−.07	(.14)	−.47***	(.14)			.68	2.96	4.04
Italy	.01*	(.01)	.43***	(.15)	−.12	(.17)	.31**	(.15)	.78	2.46	1.73
Japan	.01*	(.01)	.45**	(.15)	.31**	(.15)			.83	3.18	2.12
Korea	.05***	(.01)							.00	5.07	4.65
Luxembourg	.03***	(.00)							.00	2.79	2.17
Netherlands	.01***	(.00)	.42***	(.14)					.42	2.34	2.21
New Zealand	.01***	(.00)	.37**	(.16)	−.30*	(.16)			.54	1.31	2.39
Norway	.03***	(.00)							.00	2.51	2.48
Portugal	.02***	(.01)	.27*	(.15)					.27	3.29	4.87
Spain	.01***	(.00)	.64***	(.11)					.64	2.69	1.91
Sweden	.01***	(.00)	.44***	(.14)					.44	1.52	1.84
Switzerland	.00***	(.00)	.63***	(.12)					.63	1.32	1.18
UK	.02***	(.00)	.55***	(.16)	−.28*	(.15)			.53	2.51	1.80
USA	.02***	(.00)	.31**	(.15)					.31	2.60	1.56

Notes: Standard errors in parentheses. LAR is the modulus of the largest root of the characteristic polynomial. *significant at 10%; **significant at 5%; ***significant at 1%

Table A2: **OLS estimates of the AR process in developing countries**

	ϕ_0		ϕ_1		ϕ_2		ϕ_3		LAR	g(%)	σ(%)
Argentina	.01***	(.01)							.00	.84	6.10
Barbados	.01*	(.01)							.00	1.43	6.39
Benin	.01*	(.01)							.00	1.17	4.73
Burkina Faso	.01*	(.01)							.00	.95	4.50
Bolivia	.01	(.01)	.22	(.14)	.14	(.13)	−.41	(.13)	.75	.58	3.53
Brazil	.03***	(.01)							.00	3.09	5.16
Burundi	.00	(.01)							.00	.27	8.00
Cameroon	.01	(.01)	.04	(.15)	.37***	(.15)			.63	.89	5.63
Chile	.03***	(.01)							.00	2.87	9.07
China	.04***	(.01)	.31**	(.15)					.31	5.23	3.96
Cote d'Ivoire	.01*	(.01)							.00	1.23	5.94

Notes: see Table A1

Table A2: **OLS estimates of the AR process in developing countries** (Continued)

	ϕ_0		ϕ_1		ϕ_2		ϕ_3		LAR	$g(\%)$	$\sigma(\%)$
Colombia	.01	(.01)	.01	(.14)	.45***	(.14)			.68	1.44	2.52
Congo	.00	(.02)							.00	.21	1.05
Costa Rica	.01	(.01)	.30**	(.14)					.30	1.60	3.91
Dominican	.03***	(.01)							.00	3.22	7.86
Ecuador	.01***	(.00)	.39***	(.14)					.39	1.47	2.83
Egypt	.03***	(.01)							.00	2.57	4.13
El Salvador	.01	(.01)	.56***	(.13)					.56	1.38	3.41
Ethiopia	.02	(.01)	−.28*	(.15)					−.28	1.46	8.36
Gabon	.02	(.02)							.00	2.25	11.56
Gambia	.00	(.02)							.00	.43	1.63
Ghana	.00	(.01)							.00	−.23	6.99
Guatemala	.00	(.00)	.94***	(.15)	−.55***	(.20)	.36**	(.15)	.81	.53	1.28
Guinea	.01	(.01)							.00	.63	4.18
Honduras	.01**	(.01)							.00	.91	3.69
India	.02***	(.01)							.00	2.15	3.25
Indonesia	.03***	(.01)	.24	(.15)					.24	4.21	4.82
Iran	.02	(.01)							.00	1.57	8.37
Jamaica	.00	(.01)	.32	(.15)					.32	.65	5.24
Jordan	.00	(.01)	.18	(.16)	.28	(.15)			.62	−.17	7.54
Kenya	.00	(.01)	−.24	(.15)					−.24	−.25	7.14
Madagascar	−.01	(.01)							.00	−1.24	3.89
Malawi	.02	(.01)	−.26	(.15)					−.26	1.81	5.34
Malaysia	.03	(.01)	.24	(.15)					.24	3.56	5.44
Mali	.02	(.01)	−.37	(.15)					−.37	1.23	7.31
Mauritius	.04	(.01)							.00	3.79	9.29
Mexico	.01	(.01)	.25	(.15)					.25	1.76	3.53
Morocco	.02	(.01)	−.28	(.14)	.23	(.11)			.64	2.33	5.00
Nepal	.01	(.01)	−.37	(.15)					−.37	1.08	3.35
Nigeria	.00	(.02)	.04	(.15)	−.45	(.15)			.67	.23	1.26
Pakistan	.02	(.01)							.00	2.45	4.48
Panama	.03***	(.01)	−.36	(.15)					−.36	2.45	7.18
Paraguay	.02***	(.01)							.00	2.02	4.87
Peru	.02**	(.01)							.00	1.74	6.83
Philippines	.02***	(.00)	.40***	(.15)	.00	(.16)	−.32**	(.14)	.74	1.67	2.10
Rwanda	.01	(.01)							.00	.82	9.64
South Africa	.01**	(.00)	.44***	(.14)					.44	1.46	2.24
Senegal	.00	(.01)							.00	−.06	4.34
Sri Lanka	.03***	(.01)							.00	3.20	5.06
Syria	.04***	(.02)	−.35**	(.15)					−.35	3.00	13.76
Tanzania	.00	(.01)	.18	(.16)	.23*	(.14)	−.32**	(.13)	.73	.38	3.29
Thailand	.03***	(.01)	.33**	(.15)					.33	3.89	3.66
Trinidad & Tobago	.02	(.01)							.00	2.49	8.24
Uruguay	.01	(.01)	.23*	(.15)	.06	(.17)	−.41***	(.17)	.77	1.30	5.96
Venezuela	.01	(.01)	.38**	(.15)					.38	.96	5.76
Zambia	−.01	(.01)							.00	−.66	9.25
Zimbabwe	.01	(.02)							.00	.69	12.69

Notes: Standard errors in parentheses. LAR is the modulus of the largest root of the characteristic polynomial. *** =one percent significant, ** =five percent significant, * =ten percent significant

B Higher risk aversion level

Table 9: **Posterior quantiles of welfare effects in developed countries**

	λ (%)			ζ (%)			λ (%) $-$ ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Australia	1.77	2.48	3.62	18.72	19.59	20.59	−18.14	−17.10	−15.83
Austria	4.27	10.43	42.95	17.87	19.56	25.29	−14.38	−9.18	18.73
Belgium	2.79	8.68	47.72	17.80	20.40	31.57	−16.72	−11.84	18.37
Canada	3.34	6.02	14.40	18.69	20.20	22.40	−16.78	−14.06	−6.71
Denmark	4.14	6.02	9.11	19.77	21.30	23.04	−17.27	−15.25	−12.49
Finland	7.30	10.53	16.91	17.66	19.48	21.73	−11.88	−8.86	−3.64
France	3.92	9.12	36.55	18.03	19.92	25.21	−15.21	−10.71	11.92
Greece	12.48	30.77	81.30	17.34	20.78	28.56	−5.83	9.93	54.07
Hong Kong	20.65	40.70	85.08	15.20	18.39	24.57	4.37	22.42	61.98
Iceland	24.74	47.53	88.56	18.61	22.49	28.49	4.99	24.97	61.51
Ireland	9.48	19.34	58.92	17.72	20.20	26.38	−9.52	−0.86	33.84
Israel	7.19	11.17	20.82	17.49	18.87	20.99	−11.23	−7.70	0.43
Italy	3.25	8.11	44.01	17.20	19.62	29.74	−15.50	−11.42	15.73
Japan	18.08	46.11	90.87	18.26	23.24	31.39	−1.00	22.70	61.86
Korea	11.68	17.35	28.74	14.44	16.10	18.61	−3.75	1.28	10.88
Luxembourg	2.95	4.33	6.51	17.46	18.50	19.78	−15.62	−14.19	−12.05
Netherlands	6.54	13.80	45.86	18.49	20.70	25.99	−13.30	−7.00	19.39
New Zealand	5.49	10.16	28.29	20.92	22.82	26.27	−16.90	−12.52	2.68
Norway	4.11	5.87	8.79	17.98	19.24	20.82	−15.24	−13.37	−10.71
Portugal	21.63	43.44	86.50	17.70	21.66	28.47	2.74	21.82	59.52
Spain	9.95	22.02	66.86	17.75	20.99	29.38	−8.95	0.93	39.69
Sweden	5.32	11.07	38.37	19.99	22.27	28.19	−16.11	−11.14	11.30
Switzerland	3.96	8.92	36.18	20.54	22.63	28.54	−17.93	−13.64	8.68
UK	4.00	7.62	24.07	18.12	19.60	22.70	−15.27	−11.83	2.14
USA	2.38	4.50	12.05	17.80	18.90	20.81	−16.50	−14.36	−7.79

Table 10: **Posterior quantiles of welfare effects in developing countries**

	λ (%)			ζ (%)			λ (%) $-$ ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Argentina	35.73	59.00	91.85	23.60	29.77	38.48	9.72	28.94	56.90
Barbados	37.04	60.49	92.54	22.24	27.88	35.77	12.37	32.26	58.97
Benin	19.17	29.77	53.27	21.62	25.56	31.83	−4.37	4.16	22.96
Burkina Faso	17.54	27.42	48.92	22.20	26.16	32.47	−6.61	1.27	17.87
Bolivia	6.42	11.57	30.17	22.13	25.00	30.87	−18.28	−13.50	1.13
Brazil	18.39	28.48	49.42	17.66	20.62	25.33	−0.72	7.93	24.99
Burundi	61.82	87.00	98.67	25.11	31.38	38.42	33.89	54.70	67.15
Cameroon	44.42	76.18	97.64	24.32	30.02	37.42	17.07	45.49	65.22
Chile	60.40	85.11	98.79	19.52	24.08	29.01	39.33	60.76	73.61
China	12.04	24.14	66.64	14.29	16.65	21.86	−3.00	7.67	45.53
Cote d'Ivoire	32.27	52.68	88.23	22.33	27.94	36.16	7.68	24.82	53.48

Table 11: **Posterior quantiles of welfare effects in developing countries**

	λ (%)			ζ (%)			λ (%) − ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Colombia	11.02	26.92	76.00	21.28	25.11	34.10	−11.85	1.91	43.27
Congo	75.90	93.42	99.36	22.69	27.48	33.43	49.72	65.54	72.91
Cost Rica	18.50	37.51	84.61	20.81	25.36	33.43	−4.28	12.12	52.77
Dominican, Rep.	46.91	73.46	97.28	18.98	23.63	29.16	26.27	49.52	70.89
Ecuador	11.20	23.05	69.38	20.62	24.08	31.86	−11.37	−0.72	37.59
Egypt	11.76	17.82	28.86	18.15	20.51	23.74	−7.82	−2.80	6.30
EL Salvador	27.08	56.19	93.25	21.91	28.03	36.09	2.47	28.54	60.78
Ethiopia	41.64	67.39	95.43	22.79	28.05	35.25	16.43	39.33	63.91
Gabon	74.94	94.09	99.18	17.98	22.21	25.00	53.45	71.09	77.20
Gambia	78.65	91.86	99.59	21.52	25.28	30.57	53.97	67.03	73.91
Ghana	53.85	79.51	97.78	27.22	34.40	43.18	23.39	44.10	61.35
Guatemala	5.06	13.44	64.51	21.71	25.78	39.52	−19.35	−12.03	26.71
Guinea	15.64	24.04	41.84	22.75	26.69	32.56	−9.60	−2.47	11.47
Honduras	11.65	17.39	28.32	21.86	24.80	29.13	−12.37	−7.40	1.10
India	7.53	10.98	17.25	18.72	20.68	23.16	−12.73	−9.64	−4.49
Indonesia	18.41	36.94	79.77	16.16	19.34	25.19	1.16	17.22	55.39
Iran	60.00	85.67	98.52	22.10	27.44	33.61	35.64	57.36	70.34
Jamaica	36.87	67.37	96.55	24.25	30.71	39.09	10.41	35.74	62.03
Jordan	1.96	82.46	99.10	0.13	28.15	36.31	1.82	52.44	69.02
Kenya	38.32	63.66	93.67	27.45	34.57	44.27	8.22	28.81	54.68
Madagascar	18.61	28.65	49.68	29.80	35.83	45.03	−15.43	−7.00	8.15
Malawi	14.72	24.06	47.63	19.92	23.03	28.51	−6.89	1.10	21.24
Malaysia	26.29	49.99	90.45	17.58	21.58	27.91	7.25	28.17	64.21
Mali	28.87	49.68	86.34	22.65	27.62	35.45	4.38	21.72	53.70
Mauritius	58.99	84.40	98.63	18.21	22.13	26.55	38.77	61.84	75.38
Mexico	12.59	25.14	64.84	19.98	23.46	30.35	−9.16	1.67	36.17
Morocco	19.83	37.74	80.54	20.30	24.30	31.62	−1.63	13.45	49.90
Nepal	5.44	8.20	14.06	21.25	22.99	25.54	−17.44	−14.79	−9.63
Nigeria	68.98	90.10	99.23	27.02	32.08	37.99	39.06	57.14	67.57
Pakistan	14.41	22.12	36.53	18.50	21.25	25.33	−5.69	0.77	12.95
Panama	24.72	40.60	75.68	19.48	23.12	29.51	3.52	17.62	46.70
Paraguay	18.24	28.01	47.60	19.53	22.94	28.10	−2.89	4.98	20.84
Peru	41.84	66.37	94.99	22.03	27.35	34.77	18.04	38.53	63.37
Philippines	2.365	4.154	9.371	19.302	20.866	22.887	−18.834	−16.705	−11.907
Rwanda	72.64	91.85	99.31	22.52	27.10	32.58	47.20	63.64	72.56
South Africa	7.99	16.43	50.73	20.36	23.14	29.74	−14.12	−6.61	20.89
Senegal	19.20	29.24	50.12	25.32	29.96	37.56	−8.96	−0.66	15.02
Sri Lanka	17.40	26.29	44.83	17.39	20.09	24.29	−1.30	6.30	22.15
Syria	71.21	91.82	99.34	19.23	22.80	26.93	50.04	68.56	76.54
Tanzania	6.21	11.90	35.46	22.51	25.58	31.90	−19.03	−13.50	5.11
Thailand	12.52	25.07	69.32	16.15	18.82	24.61	−4.74	6.32	45.83
Trinidad & Tobago	54.60	81.04	98.07	20.70	25.28	30.95	32.08	55.33	70.81
Uruguay	16.85	31.53	76.46	20.84	25.40	34.04	−6.72	6.40	44.02
Venezuela	45.53	76.00	97.57	23.49	29.35	37.35	18.88	45.52	65.76
Zambia	75.80	92.92	99.09	25.92	30.69	38.03	45.22	60.96	68.99
Zimbabwe	64.43	87.93	98.90	19.98	25.59	32.32	41.29	61.25	72.77

C Higher intertemporal elasticity of substitution

Table 12: **Posterior quantiles of welfare effects in developed countries**

	λ (%)			ζ (%)			λ (%) − ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Australia	1.29	1.79	2.61	31.13	32.07	33.03	−31.31	−30.27	−29.03
Austria	3.42	7.68	31.81	29.40	32.82	34.89	−30.14	−25.04	1.53
Belgium	4.38	13.95	63.22	23.11	30.98	34.00	−28.20	−16.99	40.00
Canada	2.35	4.12	9.25	30.29	31.79	33.58	−29.97	−27.68	−22.28
Denmark	2.73	3.85	5.82	29.55	30.80	32.17	−28.51	−26.94	−24.55
Finland	5.64	8.09	12.25	30.98	32.93	35.01	−27.88	−24.84	−20.33
France	3.04	6.50	25.68	29.04	32.32	34.47	−30.17	−25.89	−3.76
Greece	10.25	24.62	75.05	27.78	33.05	37.13	−24.16	−8.43	45.86
Hong Kong	22.40	42.30	85.91	31.01	37.10	43.69	−17.22	4.63	49.81
Iceland	21.26	36.20	73.21	28.30	32.02	35.85	−11.60	3.72	41.97
Ireland	7.17	14.18	39.97	29.43	32.90	35.96	−26.78	−18.72	8.89
Israel	6.75	10.34	18.94	31.65	33.54	35.48	−27.31	−23.18	−14.32
Italy	5.44	13.34	55.64	24.94	31.94	34.95	−28.11	−18.67	31.30
Japan	15.80	41.05	89.71	23.27	30.72	35.79	−17.89	9.68	63.55
Korea	13.12	18.97	28.62	35.17	39.17	43.82	−27.12	−20.21	−9.91
Luxembourg	2.43	3.40	5.18	32.19	33.51	34.97	−31.76	−30.08	−27.87
Netherlands	4.65	9.00	25.86	29.32	32.00	34.45	−28.07	−22.85	−5.64
New Zealand	3.49	6.14	14.81	28.37	29.92	31.46	−26.87	−23.77	−14.94
Norway	3.09	4.41	6.54	31.25	32.76	34.34	−30.29	−28.34	−25.77
Portugal	17.62	33.42	73.30	28.17	32.71	37.53	−16.48	0.42	41.97
Spain	7.56	16.77	54.59	27.14	32.11	35.63	−25.93	−15.43	25.85
Sweden	3.24	6.39	18.50	28.11	30.34	32.32	−27.67	−23.94	−10.94
Switzerland	2.34	5.29	20.63	27.51	29.98	31.84	−28.35	−24.61	−8.16
UK	2.97	5.57	15.17	30.69	32.50	34.24	−30.00	−27.00	−16.72
USA	1.85	3.31	8.30	31.47	33.04	34.57	−31.80	−29.72	−24.01

Table 13: **Posterior quantiles of welfare effects in developing countries**

	λ (%)			ζ (%)			λ (%) − ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Argentina	18.50	27.08	42.16	25.60	28.05	31.15	−10.23	−1.09	14.59
Barbados	20.51	31.09	47.77	26.13	28.99	32.34	−8.87	2.06	18.97
Benin	11.05	15.59	24.13	27.05	29.19	31.72	−18.91	−13.51	−4.68
Burkina Faso	9.67	14.10	21.27	26.78	28.83	31.23	−19.66	−14.87	−6.89
Bolivia	7.00	12.18	29.23	26.23	28.30	29.99	−21.72	−16.11	1.53
Brazil	14.67	21.25	33.14	30.02	33.07	36.64	−19.15	−12.02	0.06
Burundi	33.22	48.81	77.96	23.27	26.13	29.78	6.35	22.67	51.42
Cameroon	28.70	55.83	93.18	23.27	26.89	30.64	0.90	29.00	67.38
Chile	48.27	71.83	95.71	25.70	29.75	34.86	17.68	41.73	65.77
China	14.35	26.31	65.53	33.42	39.02	45.08	−26.91	−12.92	28.14
Cote d'Ivoire	17.88	26.46	39.87	26.13	28.81	31.99	−11.29	−2.45	11.42

Table 14: **Posterior quantiles of welfare effects in developing countries**

	λ (%)			ζ (%)			λ (%) − ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Colombia	6.56	15.40	58.48	25.11	29.08	31.74	−23.55	−13.87	33.66
Congo	54.06	76.83	97.07	22.06	25.07	28.89	28.38	51.62	71.99
Cost Rica	11.19	21.02	54.73	26.56	29.66	32.97	−19.15	−8.71	25.28
Dominican, Rep.	36.28	54.45	84.82	27.40	31.55	36.62	3.99	22.55	53.58
Ecuador	6.59	13.16	38.80	26.85	29.82	32.35	−23.88	−16.85	9.86
Egypt	8.77	12.78	19.28	30.05	32.40	34.93	−24.15	−19.74	−12.79
El Salvador	15.84	32.34	76.13	24.36	28.34	32.23	−13.37	3.63	49.73
Ethiopia	26.25	41.59	75.64	25.48	28.66	32.10	−3.37	12.85	47.15
Gabon	69.37	89.64	99.23	23.26	26.88	31.25	41.90	62.31	73.17
Gambia	59.48	82.57	98.43	21.90	24.98	29.02	33.97	57.52	73.54
Ghana	23.66	34.69	54.07	23.55	26.01	28.74	−2.55	8.61	28.11
Guatemala	5.74	16.26	63.76	21.61	27.71	30.12	−23.08	−11.82	40.97
Guinea	8.22	11.88	17.97	26.53	28.38	30.39	−20.44	−16.50	−10.31
Honduras	6.52	9.30	14.08	27.29	29.02	30.85	−23.01	−19.80	−14.75
India	5.33	7.61	11.38	29.86	31.69	33.70	−27.03	−24.08	−19.86
Indonesia	17.44	32.32	73.31	30.37	35.37	40.69	−19.12	−3.09	39.46
Iran	38.31	57.79	87.48	24.68	28.01	32.20	10.04	29.76	59.74
Jamaica	20.47	37.51	79.85	23.49	27.05	30.45	−7.46	10.51	53.65
Jordan	48.95	78.30	98.17	21.21	24.31	27.72	24.06	53.73	74.54
Kenya	17.69	27.76	51.88	23.91	26.30	28.70	−9.09	1.40	26.31
Madagascar	6.54	9.51	14.32	24.11	25.52	27.03	−19.37	−15.98	−10.83
Malawi	10.61	15.67	26.69	28.18	30.46	32.93	−20.42	−14.71	−3.48
Malaysia	21.65	40.15	79.96	28.42	33.06	38.13	−12.46	6.76	48.88
Mali	18.56	28.28	48.17	26.10	28.69	31.44	−10.61	−0.52	19.58
Mauritius	54.67	76.85	97.21	26.99	31.59	37.39	22.34	44.83	66.13
Mexico	8.35	14.66	34.82	27.61	30.35	33.24	−22.66	−15.84	4.54
Morocco	14.27	24.19	52.09	27.08	30.25	33.18	−16.93	−6.04	23.43
Nepal	3.66	5.37	8.73	28.31	29.62	30.97	−26.34	−24.21	−20.50
Nigeria	46.53	71.70	96.31	22.65	25.24	28.06	20.44	46.40	71.51
Pakistan	10.43	15.10	22.70	29.45	31.93	34.61	−22.11	−16.84	−9.08
Panama	19.16	29.18	49.12	28.26	31.13	34.30	−12.65	−1.83	18.21
Paraguay	12.30	17.49	26.76	28.32	30.89	33.89	−19.14	−13.38	−3.69
Peru	25.25	37.25	59.01	26.22	29.39	33.36	−4.58	7.62	29.50
Philippines	3.07	5.43	12.55	29.42	30.80	32.33	−28.02	−25.37	−17.97
Rwanda	49.70	73.59	96.16	22.93	26.08	30.12	22.98	47.40	70.05
South Africa	4.86	9.50	28.69	27.52	30.06	32.22	−25.97	−20.51	−0.48
Senegal	8.62	12.39	18.87	25.49	27.17	29.03	−18.91	−14.86	−7.94
Sri Lanka	14.21	20.36	31.54	30.27	33.36	37.08	−19.86	−12.99	−1.55
Syria	71.38	90.16	99.15	24.99	28.70	32.97	41.82	61.27	71.06
Tanzania	6.54	12.42	34.01	25.89	28.02	29.75	−21.85	−15.69	6.98
Thailand	11.79	21.39	53.80	30.91	35.11	39.57	−24.54	−13.69	20.24
Trinidad & Tobago	38.62	59.18	88.08	26.03	29.75	34.73	8.59	29.16	58.38
Uruguay	20.05	36.46	75.40	25.68	28.46	31.37	−8.88	7.81	48.71
Venezuela	28.01	52.37	91.81	23.18	27.02	31.30	−0.48	25.04	65.98
Zambia	43.63	65.15	93.14	21.63	24.39	27.85	18.89	40.54	69.05
Zimbabwe	74.32	91.97	99.38	21.04	24.17	27.79	49.86	67.63	76.17

D First sub-period: 1960-1985

Table 15: **Posterior quantiles of welfare effects in developed countries**

	λ (%)			ζ (%)			λ (%) − ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Australia	0.76	1.51	5.07	18.21	19.41	21.15	−19.07	−17.83	−14.72
Austria	1.13	1.78	3.11	15.77	16.91	18.18	2.81	3.50	4.23
Belgium	3.20	9.79	54.48	15.70	18.94	31.95	−15.09	−8.72	23.44
Canada	1.75	2.79	4.89	17.88	19.59	21.74	1.32	2.16	3.01
Denmark	2.09	5.62	37.49	18.36	21.49	26.99	−19.31	−15.60	12.91
Finland	2.91	4.77	8.39	15.69	17.51	19.97	2.20	3.35	4.48
France	1.99	7.58	39.63	17.26	20.61	38.00	−17.26	−12.90	6.74
Greece	4.94	14.03	66.82	14.41	17.54	26.89	−11.41	−3.51	41.91
Hong Kong	4.43	7.19	13.48	11.67	13.22	15.43	5.09	6.76	8.41
Iceland	9.92	19.67	63.38	14.90	18.01	24.72	−6.94	1.75	38.92
Ireland	3.72	7.24	26.03	17.94	20.10	24.94	−16.74	−12.44	2.83
Israel	4.34	9.71	31.41	17.21	18.98	22.42	−13.74	−9.61	9.56
Italy	1.80	5.83	49.77	15.47	17.68	33.12	−15.37	−12.13	22.77
Japan	5.11	14.88	64.78	13.83	17.01	26.38	−10.44	−2.19	39.08
Korea	2.79	5.32	13.22	13.05	14.71	17.15	−11.69	−9.78	−1.22
Luxembourg	3.61	8.62	35.47	16.84	18.91	23.86	−14.68	−10.07	12.97
Netherlands	6.73	15.53	55.55	16.98	19.71	25.97	−12.05	−4.01	30.65
New Zealand	2.98	5.78	17.15	20.54	23.10	27.11	−20.40	−17.17	−7.85
Norway	2.10	3.34	5.78	16.50	18.07	20.08	1.98	2.94	3.85
Portugal	20.38	42.36	87.48	15.07	21.14	33.15	3.73	22.05	61.22
Spain	5.51	12.95	52.92	17.44	22.68	36.37	−15.50	−10.09	25.81
Sweden	2.84	6.32	25.62	19.21	21.28	26.04	−18.20	−14.81	1.41
Switzerland	1.67	3.94	21.74	18.74	20.68	25.39	−19.17	−16.60	−1.83
UK	1.24	2.33	8.11	18.39	19.80	21.88	−19.09	−17.44	−12.47
USA	2.64	5.78	22.34	16.85	18.53	21.57	−15.79	−12.70	1.48

Table 16: **Posterior quantiles of welfare effects in developing countries**

	λ (%)			ζ (%)			λ (%) − ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Argentina	8.65	16.89	50.34	20.60	24.67	32.32	−15.34	−7.68	18.85
Barbados	14.76	25.42	56.62	19.33	25.15	36.55	−0.93	1.15	3.29
Benin	9.81	16.78	34.11	18.32	22.64	30.41	−0.19	1.62	3.49
Burkina Faso	7.25	12.15	24.21	20.70	25.05	32.29	−0.93	0.58	2.11
Bolivia	11.24	26.94	72.31	22.27	27.31	38.01	−13.51	−0.41	43.65
Brazil	7.41	12.41	24.22	13.70	16.30	20.29	2.73	4.65	6.57
Burundi	10.36	18.95	47.32	19.85	23.43	30.06	−12.15	−4.41	19.18
Cameroon	12.43	21.46	44.54	17.51	22.11	30.54	0.07	2.07	4.13
Chile	44.75	75.54	97.36	17.63	24.75	34.93	0.47	3.17	6.73
China	8.91	25.64	81.31	14.13	18.49	27.85	−7.50	7.00	55.06
Cote d'Ivoire	9.42	15.77	32.22	16.85	20.69	27.67	0.48	2.39	4.36

Table 17: **Posterior quantiles of welfare effects in developing countries**

	λ (%)			ζ (%)			λ (%) − ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Colombia	3.36	9.14	52.59	18.07	20.90	31.36	−16.77	−11.75	23.10
Congo, Rep.	19.32	40.80	87.48	17.21	22.59	32.44	−1.10	17.88	57.59
Costa Rica	23.72	49.38	92.23	20.27	26.75	36.86	−0.17	22.12	59.71
Dominican. Rep.	9.83	23.57	64.84	16.45	19.74	26.29	−8.15	3.48	39.97
Ecuador	8.52	21.89	73.29	17.45	21.07	29.37	−10.74	0.33	45.80
Egypt	6.73	11.12	20.59	15.82	18.67	23.30	1.40	3.13	4.81
El Salvador	29.12	60.59	95.03	20.93	28.21	38.43	4.70	31.30	62.22
Ethiopia	4.29	6.86	12.52	20.60	23.72	28.12	−0.32	0.76	1.93
Gabon	40.55	67.39	94.96	17.80	22.86	30.71	20.09	44.98	69.42
Gambia	48.04	77.42	97.62	22.37	31.45	44.08	−1.12	1.05	3.90
Ghana	26.50	52.30	94.80	30.93	41.09	64.81	−11.94	6.39	43.03
Guatemala	7.92	29.08	84.16	21.64	29.59	50.63	−19.14	−0.08	43.02
Guinea	8.08	20.49	74.42	26.88	35.00	56.69	−25.27	−14.45	23.41
Honduras	7.60	12.73	24.27	19.45	23.56	30.57	−0.51	1.10	2.65
India	5.15	8.33	15.28	18.74	22.08	26.77	0.08	1.43	2.83
Indonesia	6.57	10.97	21.01	14.00	16.48	20.21	2.64	4.41	6.25
Iran	34.47	62.23	94.64	18.52	26.28	37.61	−0.26	2.15	5.19
Jamaica	14.93	26.22	56.35	21.68	28.39	41.99	−1.66	0.24	2.19
Jordan	51.85	81.49	98.11	19.94	26.36	34.20	27.33	53.85	70.88
Kenya	37.32	65.65	95.82	28.06	37.46	50.20	4.44	27.44	54.73
Madagascar	16.20	36.50	82.87	28.72	36.72	52.62	−17.68	−0.66	37.94
Malawi	12.25	23.23	61.97	19.23	22.86	30.39	−8.80	0.28	32.49
Malaysia	5.64	9.20	16.79	15.15	17.55	21.16	2.04	3.61	5.18
Mali	15.81	29.20	66.69	21.19	28.17	42.63	−1.70	0.40	2.53
Mauritius	42.27	71.88	96.91	16.14	22.04	30.67	1.49	4.36	7.79
Mexico	9.33	21.79	65.81	18.13	21.70	29.80	−11.07	−0.01	37.75
Morocco	20.43	42.82	87.43	18.00	22.97	31.95	0.44	19.37	57.32
Nepal	3.23	5.78	14.99	22.75	25.08	28.40	−22.13	−19.08	−11.47
Nigeria	39.22	69.81	96.63	24.17	34.12	47.46	8.86	34.78	59.97
Pakistan	6.93	11.64	22.54	15.59	18.59	23.04	1.51	3.18	4.95
Panama	6.25	12.72	43.26	17.31	19.70	24.75	−12.47	−7.22	18.85
Paraguay	5.70	9.57	17.86	15.86	18.41	22.41	1.57	3.13	4.69
Peru	35.70	66.92	95.86	18.33	24.57	32.65	14.33	42.04	67.67
Philippines	4.12	8.61	39.43	18.51	21.44	27.60	−17.63	−12.40	15.56
Rwanda	28.15	52.58	90.43	19.60	27.94	41.44	−0.91	1.31	4.09
South Africa	6.36	17.14	65.24	19.63	23.30	34.21	−15.21	−6.35	32.97
Senegal	8.66	14.51	28.90	23.22	29.11	39.16	−1.91	−0.40	1.22
Sri Lanka	11.22	19.54	38.74	16.63	20.39	27.67	0.60	2.68	4.67
Syria	61.92	87.07	98.92	15.25	18.78	22.79	44.58	67.87	79.75
Tanzania	8.71	23.41	79.14	22.86	30.21	47.10	−19.36	−6.99	35.39
Thailand	1.85	2.92	5.10	15.76	17.27	19.13	2.44	3.35	4.31
Trinidad & Tobago	24.89	57.07	92.59	16.05	22.85	32.89	5.21	32.47	64.23
Uruguay	10.22	19.92	65.52	22.92	26.54	37.65	−16.47	−7.13	29.68
Venezuela	35.43	68.07	96.59	18.14	23.66	31.31	14.89	44.31	69.90
Zambia	34.02	61.79	95.04	21.04	30.28	44.26	−1.26	0.92	3.85
Zimbabwe	45.43	75.92	98.03	18.92	26.22	36.40	0.18	2.61	5.89

E Second sub-period: 1986-2003

Table 18: **Posterior quantiles of welfare effects in developed countries**

	λ (%)			ζ (%)			λ (%) $-$ ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Australia	8.24	17.87	56.62	15.33	18.80	26.50	−9.33	−0.97	32.83
Austria	0.63	1.07	2.06	18.79	20.12	21.60	−20.39	−19.03	−17.45
Belgium	0.53	1.33	18.36	19.21	20.62	25.84	−20.81	−19.07	−9.52
Canada	0.70	1.17	2.21	19.23	20.64	22.38	−20.95	−19.46	−17.80
Denmark	1.30	4.06	24.84	18.96	22.38	27.32	−21.78	−18.41	0.63
Finland	3.01	5.44	11.27	18.07	20.89	25.21	−18.74	−15.46	−10.49
France	0.80	2.43	13.16	19.50	21.12	26.34	−20.91	−18.31	−12.24
Greece	4.40	9.32	31.93	20.46	23.77	30.09	−19.21	−14.14	4.02
Hong Kong	6.16	11.19	25.32	15.78	19.23	25.35	−12.87	−8.03	3.37
Iceland	1.94	4.71	24.45	19.69	23.18	28.35	−21.92	−18.32	−1.51
Ireland	1.66	5.00	36.16	14.50	16.50	24.93	−14.66	−11.37	14.52
Israel	1.05	2.67	10.36	16.69	18.32	21.43	−17.63	−15.55	−7.58
Italy	1.23	3.86	20.11	18.82	20.80	29.53	−20.00	−17.30	−5.20
Japan	2.21	9.08	57.46	19.23	23.63	42.13	−20.50	−14.32	18.90
Korea	6.42	14.56	52.25	13.38	15.86	19.97	−8.64	−1.10	34.08
Luxembourg	2.50	5.47	21.72	17.42	19.27	23.19	−16.70	−13.65	−0.03
Netherlands	3.09	10.26	61.31	19.15	22.46	33.38	−18.11	−11.97	29.42
New Zealand	2.46	7.53	48.45	17.66	21.15	28.78	−18.85	−13.29	22.22
Norway	1.21	2.06	4.14	18.41	20.22	22.46	−20.00	−18.08	−15.75
Portugal	1.73	5.50	29.44	16.84	19.27	26.01	−17.06	−13.53	7.34
Spain	1.48	4.73	36.09	17.15	19.07	25.06	−18.11	−14.48	16.52
Sweden	5.60	15.92	66.37	20.12	24.47	36.10	−17.73	−8.43	32.96
Switzerland	0.40	1.24	12.08	21.14	23.02	27.44	−23.44	−21.65	−13.31
UK	1.84	5.16	33.80	16.67	19.05	26.44	−17.18	−13.65	7.78
USA	1.11	3.08	22.39	18.03	19.70	24.36	−18.71	−16.49	−0.41

Table 19: **Posterior quantiles of welfare effects in developing countries**

	λ (%)			ζ (%)			λ (%) $-$ ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Argentina	10.65	23.95	69.24	25.27	33.24	51.59	−22.56	−8.94	24.59
Barbados	14.57	28.21	68.55	17.10	23.07	35.95	−6.39	5.11	35.52
Benin	4.89	8.79	18.36	20.39	24.60	31.92	−20.88	−15.73	−8.35
Burkina Faso	7.36	13.48	31.85	18.15	22.81	31.43	−15.28	−9.32	4.58
Bolivia	0.60	1.78	26.06	20.66	22.46	27.90	−22.59	−20.55	−5.88
Brazil	4.66	8.21	17.32	19.68	23.79	30.25	−20.06	−15.27	−8.20
Burundi	8.98	22.98	78.99	17.90	24.36	36.88	−13.99	−1.49	46.06
Cameroon	13.24	25.25	58.45	23.76	33.12	51.20	−19.36	−7.66	14.17
Chile	2.55	4.44	8.83	13.59	15.40	17.84	−13.12	−10.88	−7.04
China	5.96	12.42	39.48	18.45	22.10	28.81	−15.58	−9.62	12.12
Cote d'Ivoire	17.12	34.07	77.64	21.87	31.43	52.97	−11.80	2.08	31.51

Table 20: **Posterior quantiles of welfare effects in developing countries**

	λ (%)			ζ (%)			λ (%) − ζ (%)		
	.005	.50	.95	.005	.50	.95	.005	.50	.95
Colombia	7.47	17.43	61.95	16.58	20.61	29.62	−12.01	−3.15	36.38
Congo	3.29	7.53	36.59	18.32	21.43	27.92	−18.08	−13.70	9.94
Costa Rica	5.09	13.09	56.32	18.38	21.77	30.08	−15.88	−8.60	28.70
Dominican. Rep.	12.19	33.71	90.95	16.52	22.84	38.52	−8.19	12.05	56.16
Ecuador	3.86	7.95	24.88	23.03	26.47	32.49	−22.90	−18.30	−4.05
Egypt	2.38	4.05	8.41	17.85	20.41	23.94	−18.90	−16.27	−12.40
El Salvador	7.97	23.13	78.11	17.80	22.39	32.78	−12.67	0.46	48.36
Ethiopia	42.59	74.94	97.59	14.78	21.40	30.93	25.13	52.88	74.21
Gabon	14.34	36.43	84.52	22.42	31.92	44.67	−15.12	5.16	42.64
Gambia	33.50	64.45	95.19	16.12	23.12	33.76	14.50	40.01	67.84
Ghana	4.76	12.65	63.77	19.22	23.14	31.09	−16.97	−10.22	33.30
Guatemala	0.27	0.90	9.07	20.60	22.11	25.06	−22.60	−21.23	−15.71
Guinea	8.47	20.46	67.54	15.39	19.09	27.33	−9.29	1.47	41.35
Honduras	1.32	2.27	4.41	21.41	23.68	26.58	−23.89	−21.37	−18.68
India	0.87	1.48	2.87	16.26	17.53	19.07	−17.37	−16.01	−14.37
Indonesia	5.45	9.66	19.65	14.24	16.98	21.44	−11.27	−7.28	0.84
Iran	12.93	25.32	62.45	17.44	23.51	35.90	−8.84	1.58	29.55
Jamaica	7.36	13.67	30.72	17.96	22.95	31.83	−15.14	−8.97	3.84
Jordan	44.82	74.64	96.99	27.14	38.11	54.14	9.40	34.88	59.00
Kenya	25.86	55.26	92.96	23.12	31.52	45.10	−1.47	22.22	55.69
Madagascar	13.44	28.84	77.82	27.08	34.73	51.08	−19.70	−6.02	33.98
Malawi	12.87	27.96	77.44	17.98	22.58	31.51	−7.36	5.17	48.09
Malaysia	12.41	23.54	55.29	14.71	19.26	28.68	−5.09	4.20	29.68
Mali	28.11	55.07	93.04	16.59	23.70	35.82	8.67	30.71	62.94
Mauritius	3.07	5.41	11.01	13.39	15.19	18.04	−12.32	−9.72	−4.93
Mexico	10.60	24.97	73.49	18.97	23.93	34.06	−11.60	0.81	42.62
Morocco	5.58	10.48	28.54	20.68	23.52	28.53	−17.65	−12.74	1.75
Nepal	1.89	4.85	29.65	18.07	20.34	26.17	−18.59	−15.30	4.70
Nigeria	39.48	71.03	96.94	18.93	26.79	37.70	16.44	43.20	67.51
Pakistan	4.16	7.35	15.30	18.61	22.10	27.58	−18.73	−14.60	−8.14
Panama	11.28	26.47	81.37	15.82	20.46	27.60	−8.30	5.29	49.70
Paraguay	9.72	17.78	44.80	20.44	26.52	39.51	−16.58	−8.47	8.84
Peru	39.67	73.19	97.51	22.99	32.80	46.98	9.96	38.62	63.11
Philippines	0.18	0.42	1.60	19.71	20.35	20.96	−20.35	−19.84	−18.86
Rwanda	40.98	71.98	96.63	17.56	25.83	38.81	18.88	44.97	67.39
South Africa	4.94	13.83	62.01	17.99	21.79	30.04	−16.31	−7.88	36.84
Senegal	7.03	12.74	29.21	20.44	25.75	35.72	−19.38	−13.07	−1.28
Sri Lanka	2.58	4.54	8.80	14.51	16.45	19.12	−14.32	−11.92	−8.14
Syria	50.50	80.32	98.01	21.34	29.39	39.55	23.27	49.67	68.81
Tanzania	3.99	9.40	42.63	18.47	22.07	30.09	−18.07	−12.52	15.01
Thailand	6.21	11.42	25.02	13.82	16.61	21.70	−10.12	−5.22	5.74
Trinidad	19.08	49.56	94.62	12.16	20.08	32.52	1.61	29.16	70.43
Uruguay	20.25	46.13	90.87	17.22	24.55	37.10	−0.78	23.27	60.32
Venezuela	19.49	45.32	90.27	27.85	37.64	56.80	−14.29	6.17	44.08
Zambia	41.62	72.87	97.51	22.40	34.24	52.99	11.55	36.49	60.69
Zimbabwe	55.27	84.06	98.78	15.15	21.28	29.99	35.71	61.29	77.18