Financial Globalization and Inequality

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- This phenomenon is *inconsistent* with Kuznets' inverted-U hypothesis,
- according to which, at early stages of economic development, inequality in a country goes up, whereas at some point in a process of development, it starts to decline as an economy matures.
- In contrast with Kuznets' hypothesis, income inequality in the United States has widened for the last three decades in spite of the maturity of the economy.

Existing Explanations

The First Strand:

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- Empirical explanation: Skill-biased technological innovation is emphasized (e.g. Katz and Murphy (1992) and Autor, et al. (1998))
- Theoretical foundation 1: Galor and Moav (2000) establish a model that explains income inequality not only between skilled and unskilled workers but also within each category.
- Theoretical foundation 2: Aghion, Howitt, and Violante (2002) provide a model in which income inequality originates in the enlarged generality of new technologies.

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- Authors attribute income inequality to trade globalization (e.g., Wood (1995, 1998)).
- Theoretical foundation: the Hechscher-Ohlin model. According to the Hechscher-Ohlin model, in a country with abundant skilled workers, trade globalization benefits skilled-workers and disadvantages unskilled-workers.

Open Question

- Complementing the above two hypotheses, this paper provides another explanation for income inequality in the United States, investigating effects of financial globalization on it.

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- Whether financial globalization widens or reduces inequality within a country is an open question theoretically and empirically.

Stylized Facts in the United States

- Income inequality

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- Financial development

Stylized Facts in the United States

- This paper demonstrates that the above stylized facts are not separate things but they are closely related.
- In particular, we reveal that income inequality in the United states relates to financial globalization and financial development.
- Whether financial deepening widens or shrinks income inequality within an economy is an open question as well (Levine (2005)). According to our model, the answer to this question depends upon whether an economy is financially open to the world market or not.

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- When an economy is open and becomes so small due to financial globalization that the world interest rate is not affected by the degree of financial development in the economy, the Gini coefficient is monotonically increasing with respect to financial development.
- Our calibration shows that income inequality in the United States is negatively affected by its financial sector development. In the United States, financial development has widened income inequality since the 1980s probably due to financial globalization.

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- More precisely, less capable agents become savers because their marginal products for creating intermediate goods are less than the market interest rate.
- More capable agents become investors to create intermediate goods because their marginal products are greater than the interest rate.

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- In the case of a closed economy, the first effect dominates the second effect: inequality shrinks without fail.

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- If the financial sector develops in an economy more fully than in the rest of the world, then production resources flow into the economy and thus investors benefit from the inflow of the production resources even though the world interest rate is constant
- In this case income inequality widens if financial development in the economy proceeds.

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- They show that after financial liberalization, a country with a fully developed financial sector experiences an increase in wealth inequality.
- By contrast, our model demonstrates that when the financial markets in each country are integrated into the world market, financial deepening in a country widens inequality.

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- Galor and Zeira (1993) and Banerjee and Newman (1993) demonstrate that there exists a “negative linear" relationship between financial development and income inequality.
- None of these authors consider an impact of financial globalization on inequality. Financial globalization is important when we consider the relationship between financial development and inequality because it changes the ways financial development affects inequality.

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- As demonstrated in Galor and Moav (2002), the differences in salaries must originate in the differences in capabilities of agents.
- We focus on this point, omitting the income inequality arising from bequests, initial wealth distribution, and so forth. That is to say, we do not consider ex-ante poor and rich.

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- and consists of a financial intermediary called the Bank, a continuum of agents whose measure is equal to L, and a firm that is engaged in the final production.
- Agents in the economy trade with each other financially via the Bank.

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- If he borrows $-b > 0$, his total resources are $k := w - b$.
- Let the (gross) return on one unit of investments be R.
- The Bank monitors borrowers only when they default. When the Bank monitors a borrower, it has to pay costs $-rbC(p)$ to collect $-prb$, where $C : [0, 1) \to \Re_+$ is twice continuously differentiable, $\frac{\partial C(.)}{\partial p} > 0$, $\frac{\partial^2 C(.)}{\partial p^2} > 0$, $C(0) = 0$, $\lim_{p \to 1} C(p) = \infty$, and $C'(0) < 1$.

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- The default costs are considered as fines or social sanctions.

Credit Market

Under this loan contract, the incentive compatibility constraint so as for a borrower not to default is given by:

$$Rk + rb \geq (R - \theta r)k + prb, \tag{1}$$

which is rewritten as:

$$b \geq -\frac{\theta}{1-p}k. \tag{2}$$

Credit Market

In order to choose an optimal probability, the Bank solves its maximization problem such that:

$$\max_{p} \quad -prb + rbC(p),$$

which is rewritten as:

$$\max_{p} \; p - C(p).$$

From the first-order condition, we have:

$$p = C'^{-1}(1). \tag{3}$$

Credit Market

Substituting Eq.(3) into Eq.(2) gives:

$$b \geq -\frac{\theta}{1 - C'^{-1}(1)} k. \tag{4}$$

Since $\theta < 1 - C'^{-1}(1)$, we can let $\mu := \frac{\theta}{1 - C'^{-1}(1)} \in (0, 1)$ and thus:

$$b \geq -\mu k, \tag{5}$$

which is a credit constraint.
μ is the measure of financial development

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- The objective of each agent is to maximize his income at the end of the period.
- In order to obtain income at the end of the period, each agent has to start an investment project or deposit his wealth in the Bank.
- At the beginning of the period, each agent may borrow from the Bank if he wants; however, the Bank imposes credit constraints on borrowers in order to avoid default.

Individuals

The constraints an agent faces are as follows:

$$b + k \leq w \tag{6}$$

$$b \geq -\mu k \tag{7}$$

$$k \geq 0, \tag{8}$$

where k is capital to start a project. b is a deposit if positive and a debt if negative.

Individuals

An agent maximizes income y at the end of the period:

$$y = rb + q\phi k, \tag{9}$$

where r is the gross interest rate. ϕk is intermediate goods created by the agents, where ϕ is the marginal product of the agent and q is the price (relative to the final goods) of the intermediate goods.

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- When he solves his maximization problem, he knows his own productivity.
- However, since it is private information, no other agents including the Bank know his productivity.
- ϕ has a time-invariant distribution $G(\phi)$ whose support is $[0, a]$, where $a > 0$.

Heterogeneity

Assumption

1. $\int_0^a \phi dG(\phi) < \infty$.
2. $G(\phi)$ *has a continuous density* $g(\phi)$ *on* $[0, a]$.

Final Production

The production function for the final goods is given by:

$$Y = AH, \tag{10}$$

where $H = \int_0^a \phi k L dG(\phi)$ and A is the productivity parameter.

In equilibrium, we have:

$$q = A.$$

Solution to the Maximization

Lemma 1 provides a solution to an agent's maximization problem.

Lemma

- *If* $r > A\phi$, *then* $k = 0$ *and* $b = w$.
- *If* $r < A\phi$, *then* $k = \frac{w}{1-\mu}$ *and* $b = -\frac{\mu w}{1-\mu}$.

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- If an agent has sufficiently high productivity such that it is greater than $\frac{r}{A}$, he starts a project borrowing from the Bank.
- If an agent has low productivity such that it is less than $\frac{r}{A}$, he becomes a saver depositing all his initial wealth in the Bank.

Per Capita Income

In what follows, the Lorenz curve and the Gini coefficient are derived.

Lemma

Suppose that r is given, then per capita income $\tilde{y}$ of this economy is given by:

$$\tilde{y} = \frac{r(G(r/A) - \mu) + AF(r/A)}{1 - \mu} w, \tag{11}$$

where $F(r/A) := \int_{\frac{r}{A}}^{a} \phi dG(\phi)$.

Lorenz Curve

Lemma

The Lorenz curve $L(x)$ in this economy is given by:

$$L(x) = \begin{cases} \frac{r(1-\mu)}{r(G(r/A)-\mu)+AF(r/A)}x & \text{if} \quad 0 \leq x < G(r/A) \\ \frac{-AF(G^{-1}(x))-\mu rx+AF(r/A)+rG(r/A)}{r(G(r/A)-\mu)+AF(r/A)} & \text{if} \quad G(r/A) \leq x \leq 1 \end{cases}$$

where $x := G(\phi)$.

Lorenz Curve

For the rest of the current paper, we assume that ϕ has a uniform distribution in $[0, a]$ so that our investigation for Gini coefficients can be concrete.

Since $G(\phi) = \frac{\phi}{a}$ and $F(\phi) = \frac{a^2 - \phi^2}{2a}$, the Lorenz curve becomes:

$$L(x) = \begin{cases} \frac{2aAr(1-\mu)}{(aA)^2 - 2\mu raA + r^2} x & \text{if} \quad 0 \leq x < \frac{r}{aA} \\ \frac{(aA)^2 x^2 - 2\mu raAx + r^2}{(aA)^2 - 2\mu raA + r^2} & \text{if} \quad \frac{r}{aA} \leq x \leq 1 \end{cases}$$

Gini Coefficient

The Gini coefficient is obtained as follows:

$$Gini = \frac{(aA)^3 - 3r^2aA + 2r^3}{3aA((aA)^2 - 2\mu raA + r^2)}. \tag{12}$$

Remarks

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- Endogenous inequality (e.g., Galor and Moav (2000) and Matsuyama (2000)).

Closed Economy

The credit market clearing condition is given by:

$$\int_0^{\frac{r}{A}} bLdG(\phi) + \int_{\frac{r}{A}}^{a} bLdG(\phi) = 0. \tag{13}$$

From lemma 1, this is rewritten as:

$$G(r/A) = \mu. \tag{14}$$

Per Capita Income

Per capita income in a closed economy is given by:

$$\tilde{y} = \frac{AF(r/A)}{1 - G(r/A)} w. \tag{15}$$

Essence of Financial Development

Proposition

Suppose that an economy is closed. Then, as the financial sector fully develops, per capita income goes up, i.e., $\frac{\partial \tilde{y}}{\partial \mu} > 0$.

In this general equilibrium model, as a financial sector develops very well, less talented agents come to be able to utilize the abilities of more talented agents. This is an essence of financial development.

Inequality in a Closed Economy

The Gini coefficient is derived as follows:

$$Gini = \frac{(1-\mu)(2\mu+1)}{3(1+\mu)}. \tag{16}$$

We note that the Gini coefficient given by (16) is independent of a (and A), i.e., only μ is crucial for it.

Inequality in a Closed Economy

Proposition

Suppose that an economy is closed. Then, the Gini coefficient goes down as the financial sector fully develops, i.e., $\frac{\partial Gini}{\partial \mu} < 0$.

Multi-Country Model

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- In the multi-country model, financial development in a country has a spillover effect on another country via the world interest rate.
- We assume that the initial wealth and the final output can move freely in the world market, whereas the durable intermediate cannot move.

Net Foreign Wealth

Let B be net foreign wealth held by the country. Then it follows from lemma 1 that:

$$\frac{G(r/A)-\mu}{1-\mu}wL = B. \tag{17}$$

We note that each country faces the common world interest rate.

Financial Globalization

Assumption

- *There exists a home country whose measure is assumed to be one.*
- *There exists a continuum of small foreign courtiers.*

Assumption

- *The degree of financial development in the home country is* μ_H.
- *The foreign countries have a same value of the financial development parameter* μ_F.

In what follows, we focus our analysis on the case in which $\mu_H > \mu_F$, regarding the home country as the United States.

Financial Globalization

Let B_H and B_i be net foreign wealth in the home country and the foreign country i, respectively. The market clearing condition in the world financial market is given by:

$$B_H + \int_{i \in \mathcal{C}} B_i di = 0. \tag{18}$$

Eq.(18) is rewritten as:

$$\frac{G(r/A) - \mu_H}{1 - \mu_H} w_H L_H + \frac{G(r/A) - \mu_F}{1 - \mu_F} \int_{i \in \mathcal{C}} w_i L_i di = 0,$$

where w_H and L_H (w_i and L_i) are the initial wealth and population in the home country (the foreign country i), respectively.

Financial Globalization

Letting $M := \frac{1}{w_H L_H} \int_{i \in \mathcal{C}} w_i L_i di$ yields:

$$G(r/A) = \frac{\frac{\mu_H}{1-\mu_H} + \frac{M\mu_F}{1-\mu_F}}{\frac{1}{1-\mu_H} + \frac{M}{1-\mu_F}} := \tilde{\mu}. \tag{19}$$

The parameter M expresses the size of the world financial market relative to the one in the home country. I would like to say: Financial globalization proceeds if M increases, implying that the number of countries and/or the number of people that participate in the world financial market go up.

Financial Globalization

Lemma

As M increases from zero to infinity, $G(r/A)$ decreases from μ_H to μ_L.

This result agrees with the stylized facts that are shown in figures 2 and 3 as underdeveloped countries with poorly developed financial sectors have entered the world financial market since the mid-1980s. (Of course, this claim should be empirically examined.)

We have the Gini coefficient of the home country as follows:

$$Gini = \frac{1 - 3\tilde{\mu}^2 + 2\tilde{\mu}^3}{3(1 - 2\mu_H\tilde{\mu} + \tilde{\mu}^2)}. \tag{20}$$

Effect of Financial Globalization

$$\frac{\partial Gini}{\partial M} = \frac{2(\tilde{\mu}^4 - 4\mu_H\tilde{\mu}^3 + (3\mu_H + 3)\tilde{\mu}^2 - 4\tilde{\mu} + \mu_H)}{3(1 - 2\mu_H\tilde{\mu} + \tilde{\mu}^2)^2}\frac{\partial \tilde{\mu}}{\partial M}$$
$$= \frac{2(1-\tilde{\mu})(-\tilde{\mu}^3 + (4\mu_H - 1)\tilde{\mu}^2 + (\mu_H - 4)\tilde{\mu} + \mu_H)}{3(1 - 2\mu_H\tilde{\mu} + \tilde{\mu}^2)^2}\frac{\partial \tilde{\mu}}{\partial M} \quad (21)$$

Proposition

Suppose that μ_H and μ_F are given. Then the following hold:

- *If μ_F is small, then there exists an $\bar{M}$ such that for $M \in [0, \bar{M})$, $\frac{\partial Gini}{\partial M} > 0$ holds and for $M \in [\bar{M}, \infty)$, $\frac{\partial Gini}{\partial M} < 0$ holds.*
- *If μ_F is large, then $\frac{\partial Gini}{\partial M} > 0$ for any $M \in [0, \infty)$.*

Effect of Financial Globalization

Even though the first part of proposition 3 tells us that if μ_F is small, then there exists a hump-shaped relationship between inequality and financial globalization, we can safely say that financial globalization by and large has a negative effect on inequality in the home country.

Effect of Financial Development

Proposition

Suppose that M is sufficiently large. Then, Gini increases with μ_H.

Source of Income Inequality

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- Therefore, we predict that the Gini coefficient calibrated here is understated because we do not consider any other sources of income inequality.
- In order to compensate for this shortcoming, we examine the various values of a (or equivalently aA).

Data

We have to pin down three parameters, μ_H, $\tilde{\mu}$, and aA.

- *claims on private sector*
- *gross fixed capital formation*
- *gross saving*
- *federal funds rate*
- *GDP deflator*

We collect these data from the *International Financial Statistics 2008*, which is a database created by the International Monetary Fund (IMF).

Parameter Determination

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- Then, we obtain $PC = \mu K$.

Parameter Determination

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- Here, we note that $\Delta PC = DPC$ and $\Delta K = I$.

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- Since we cannot obtain the data for W. So we assume that the increment of the net foreign wealth is associated only with the increment of wealth in the home country.
- This assumption holds if $\Delta\left(\frac{r/aA-\mu}{1-\mu}\right)$ is so small relative to ΔW and ΔB_H that we can ignore it.

Parameter Determination

$$\mu + (1-\mu)\frac{\Delta B_H}{\Delta W} \approx \frac{1}{aA} r, \tag{22}$$

where we note that the increment of wealth is the total saving, i.e., $\Delta W = S$ and the increment of the net foreign wealth is the current account, i.e., $\Delta B_H = CA$. In order to obtain $\frac{1}{aA}$, we estimate Eq.(22) by the ordinary least squares estimation (OLS).

From the OLS, we obtain $\frac{1}{aA} = 0.275$, which is significant at the conventional level. Accordingly, we have $aA = 3.64$.

The Simulated Gini Coefficients

Now that we have obtained the values of μ_H and $\tilde{\mu}$, we can compute the simulated Gini coefficients by using Eq.(20). The benchmark case with $aA = 3.64$ is given in Figure 6.

Figure 7 provides the cases in which $aA = 4.5$, 5.0, 5.5 and 6.0. The cases in which $aA = 5.0$ and 5.5 capture the actual Gini coefficient much better than the benchmark case.

The Simulated Gini Coefficients

In figure 8, we examine what would happen if the United States was a closed economy. In a closed economy case, the Gini coefficient does not depend upon the value aA but upon only μ_H. Also, the Gini coefficient decreases with μ_H.

The Simulated Gini Coefficients

As already noted, the Gini coefficient in the multi-country model is determined by the values of $\tilde{\mu}$ and μ_H. Which has a greater effect on inequality? figure 9.

Whether financial development widens or narrows income inequality within an economy is an open question as Levine (2005) points out. We note from our calibration that at least in the United States, financial development widens income inequality.

Concluding Remarks

- Whether financial globalization benefits integrated countries is an important question in international economics.

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- Whether financial globalization benefits integrated countries is an important question in international economics.
- This paper has studied how financial globalization and financial development affects inequality within a country.
- If an economy is closed, inequality narrows as the financial sector develops.
- By contrast, if an economy is open and if the world market is sufficiently large, then inequality widens as the financial sector develops.
- The calibration for the Gini coefficients shows that income inequality in the United States is negatively affected by its financial sector development.

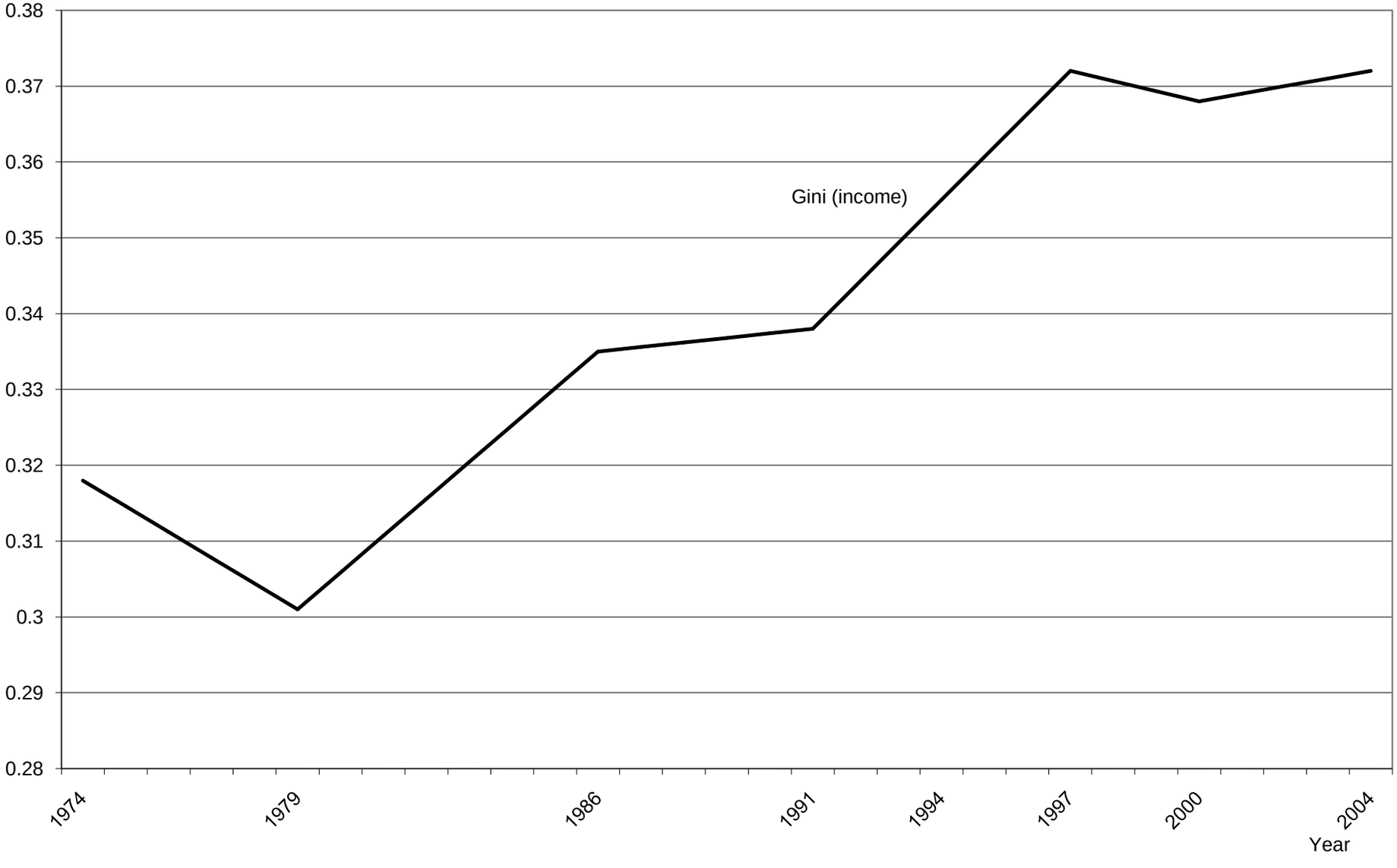
Testable Claims and Future Research

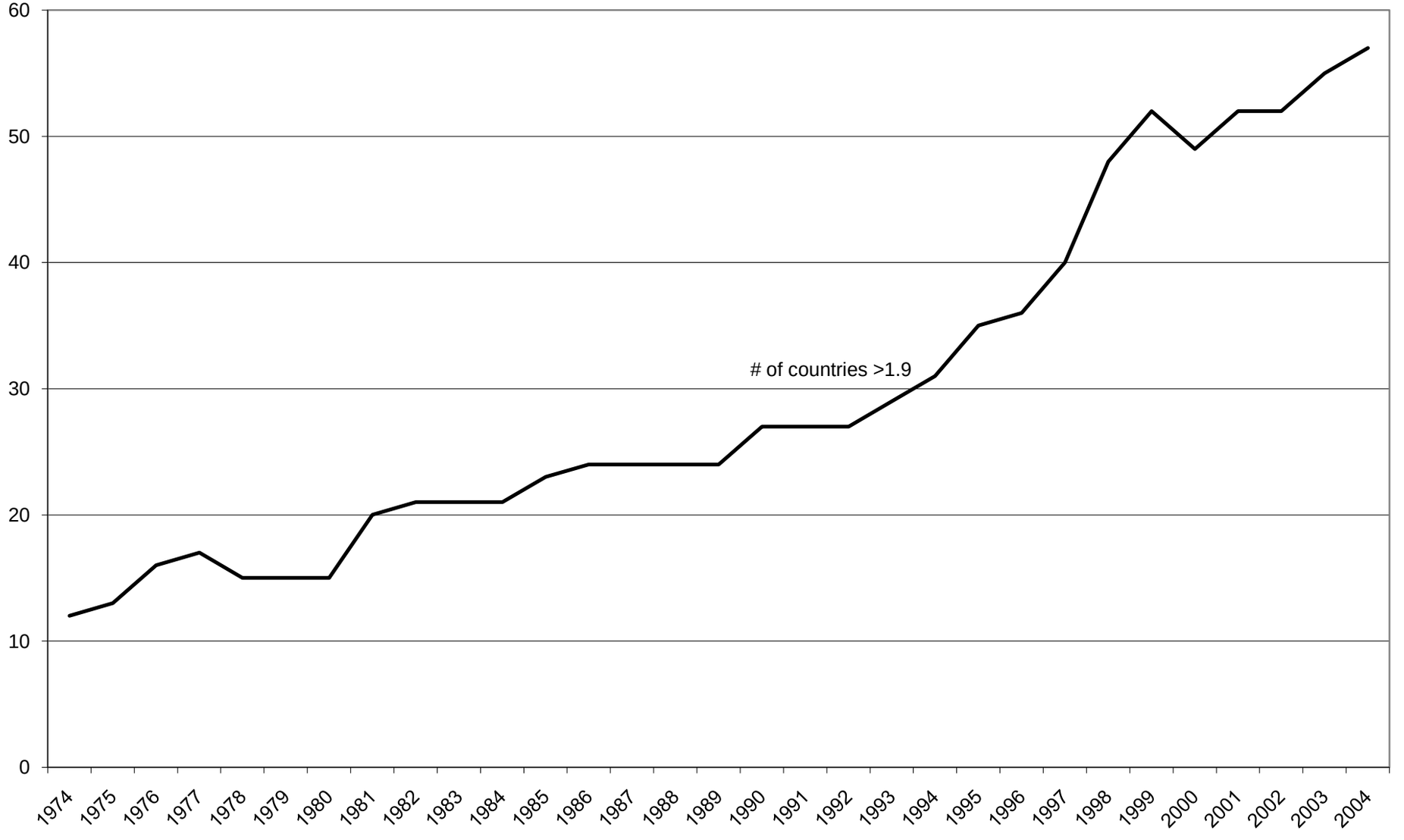
Other than the main results for income inequality, we obtain two testable claims as by-products:

- Nowadays, there are big imbalances of the current account between countries. According to Eq.(17), those big differences are due to the differences in the levels of financial development.
- As seen figure 3, the world interest rate has been decreasing recently. According to Eq.(19), this phenomenon is caused by the fact that many countries with poorly developed financial sectors have entered the world financial market.

Testable Claims and Future Research

- How well the simulated Gini coefficients capture the actual ones in the other countries is a question for future research.
- In order to take into account heterogeneous wealth endowments between agents, we have to extend our model to a dynamic general equilibrium model with infinitely-lived agents.


0.38
0.37
0.36
0.35
0.34
0.33
0.32
0.31
0.3
0.29
0.28
Gini (income)
1974
1979
1986
1991
1994
1997
2000
2004
Year


60
50
40
30
20
10
0
# of countries >1.9
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
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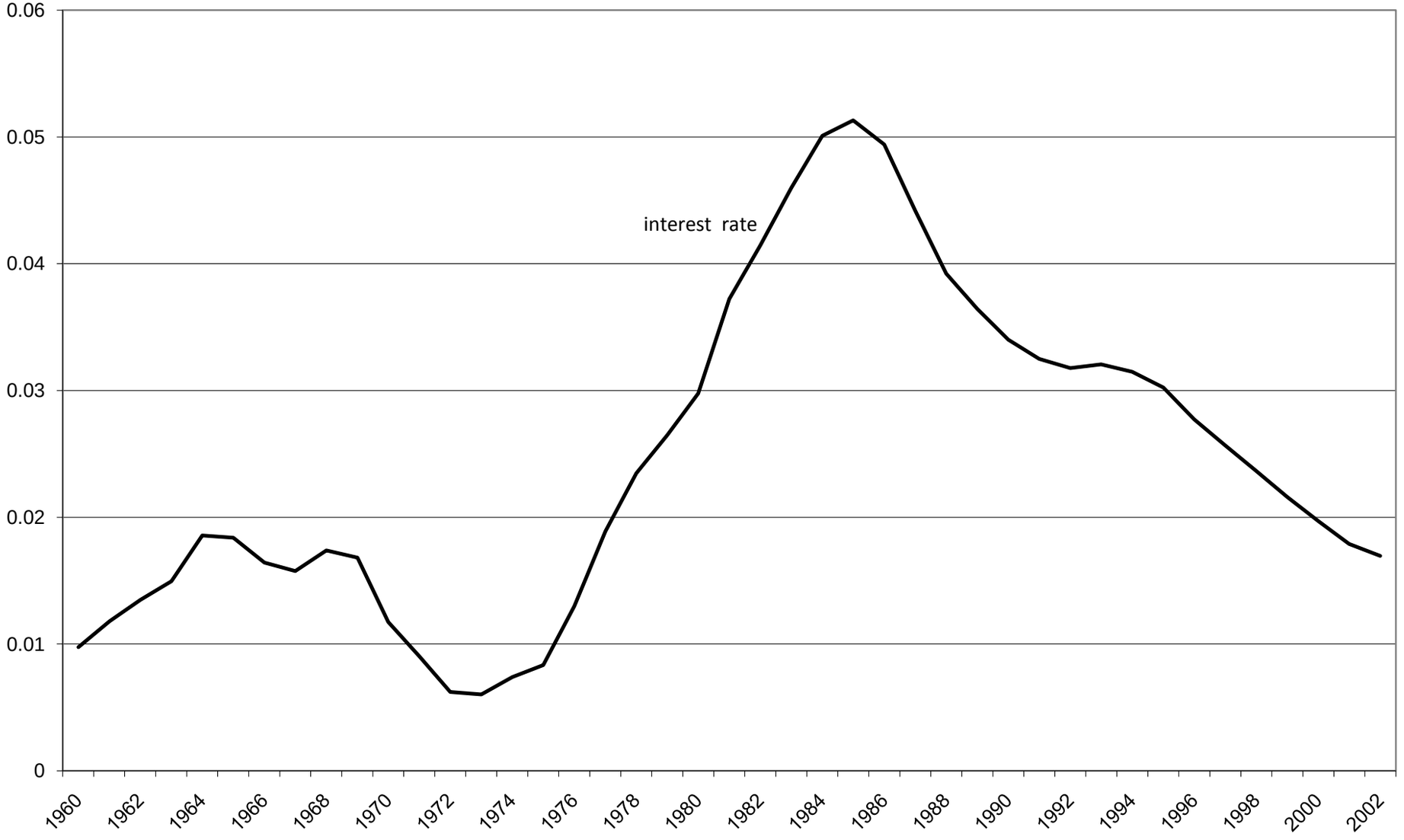
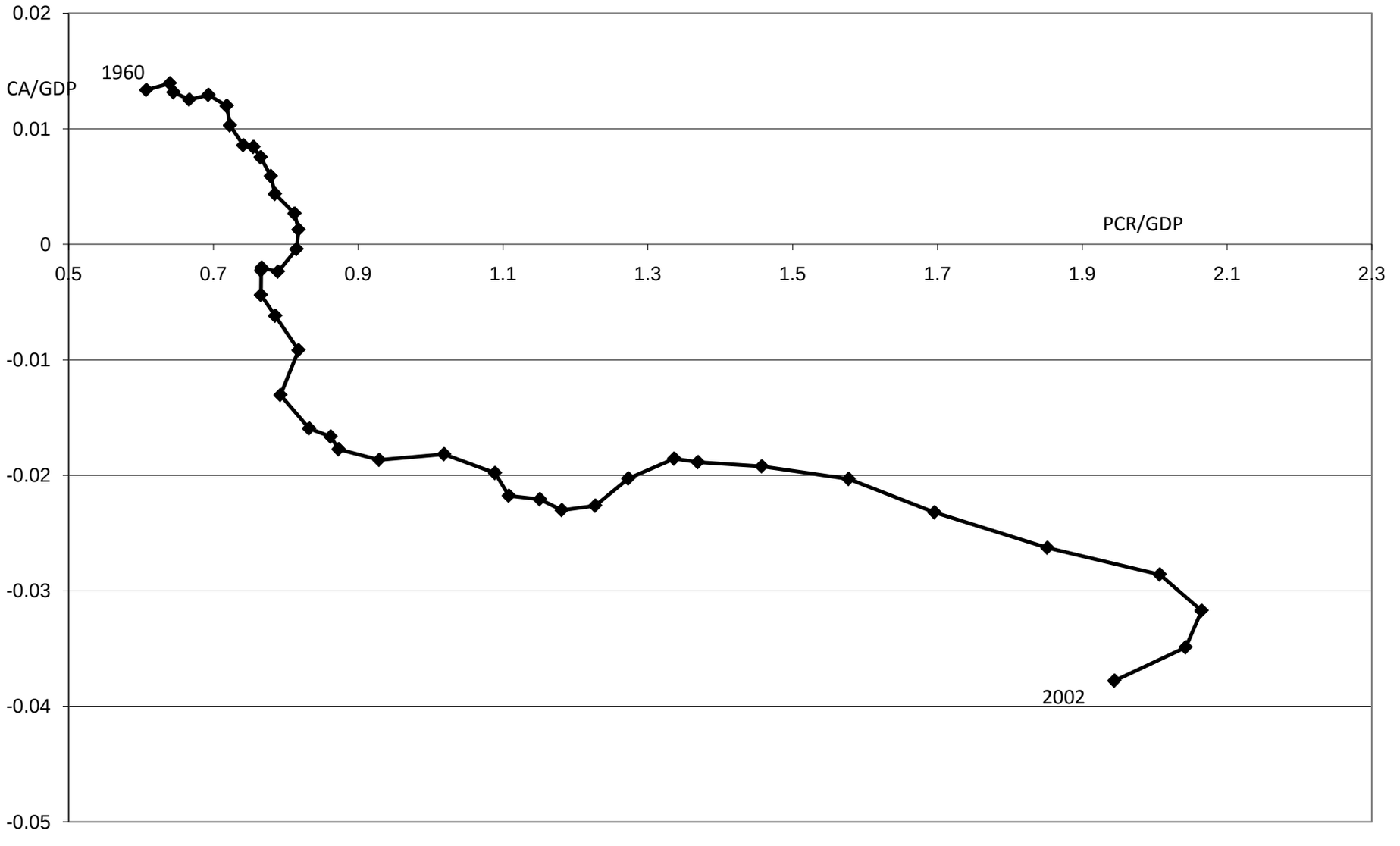
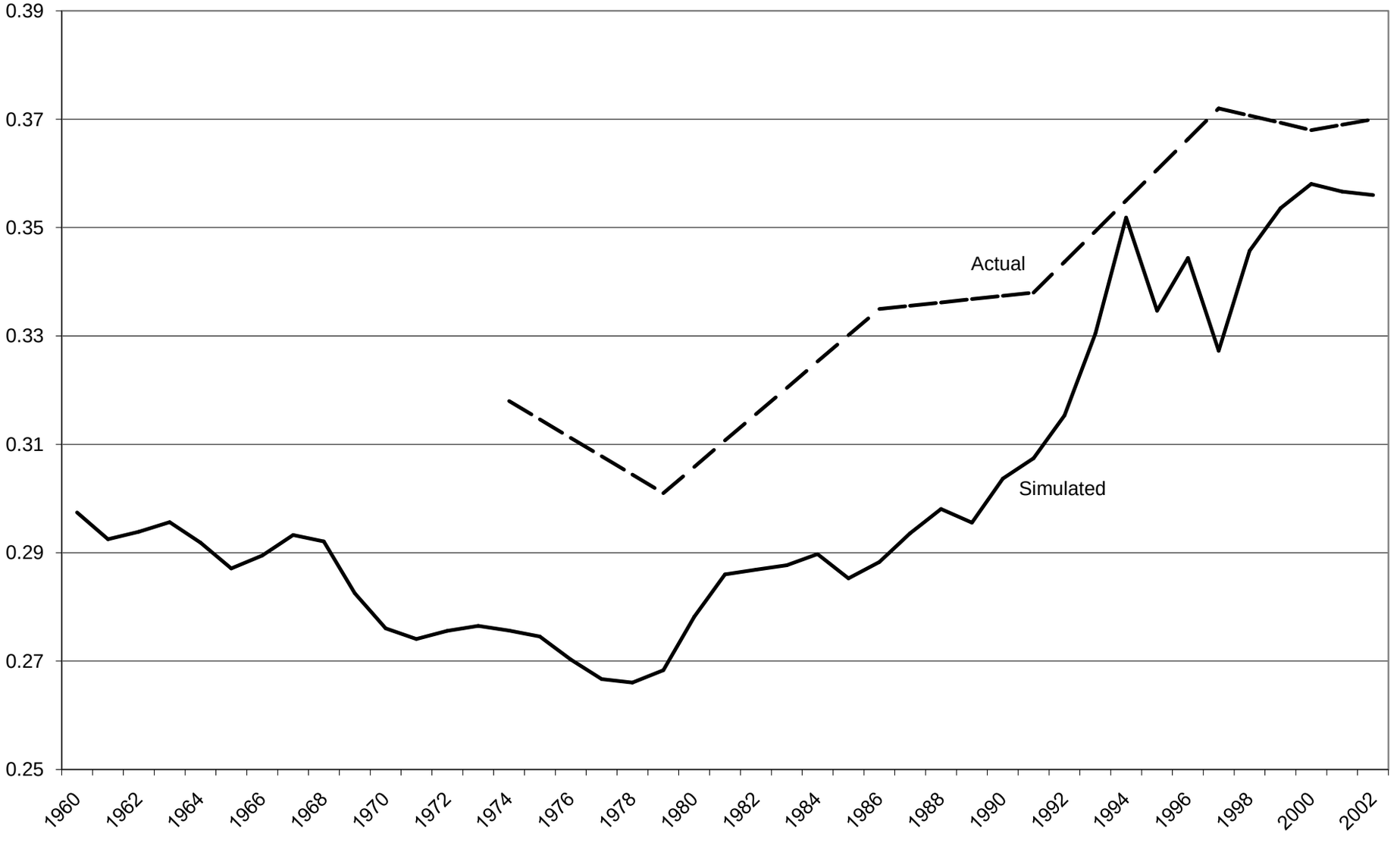
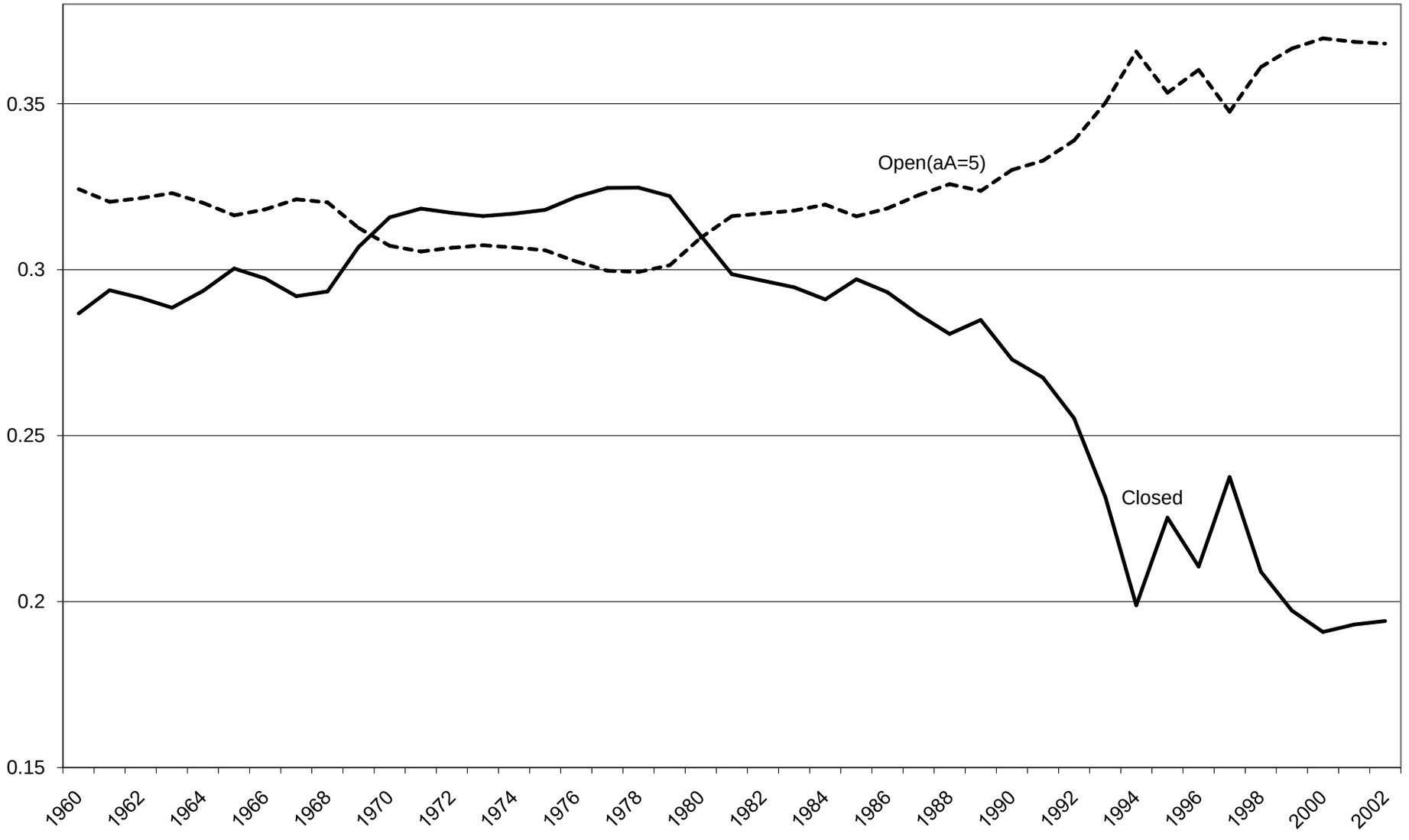
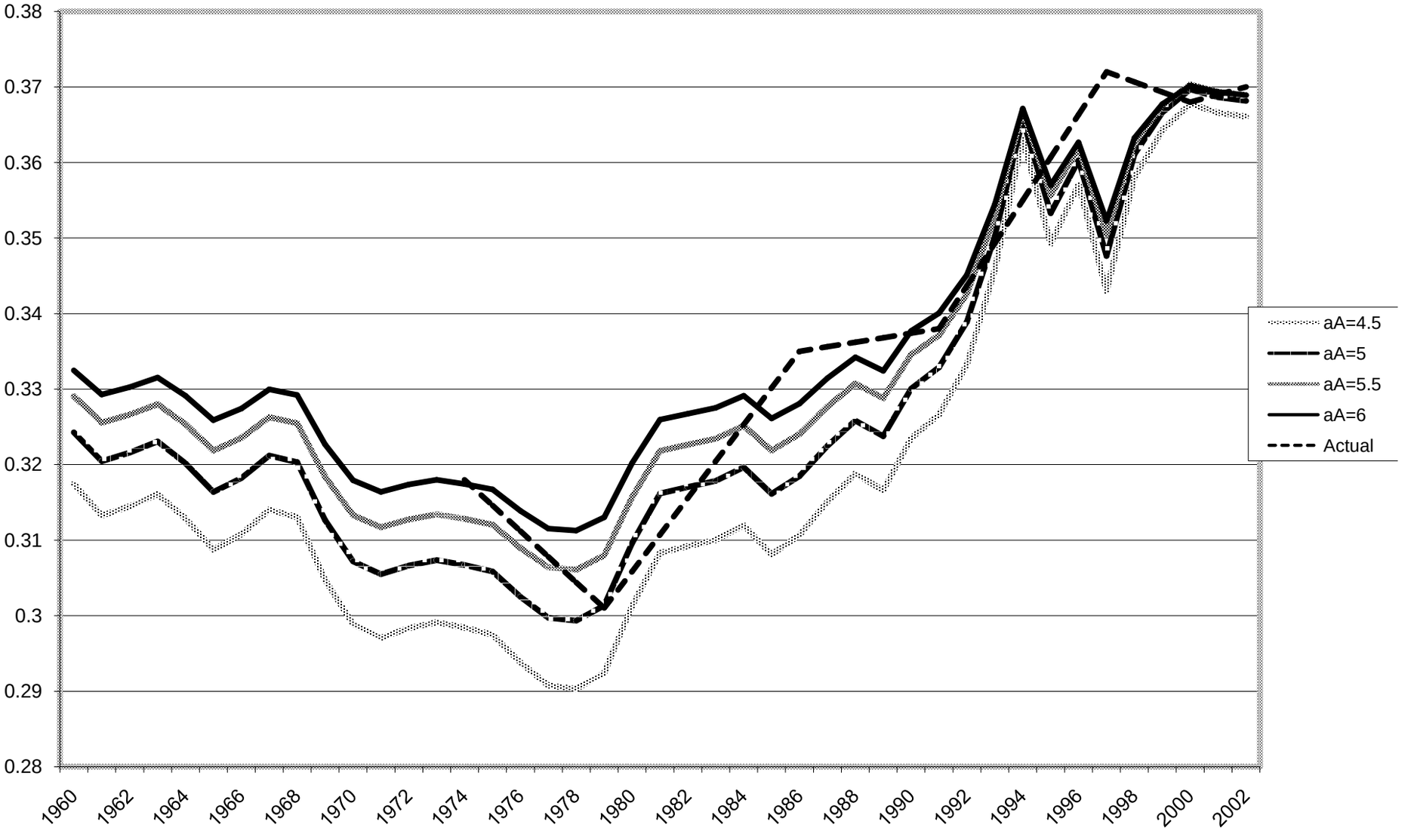
1998
1999
2000
2001
2002
2003
2004

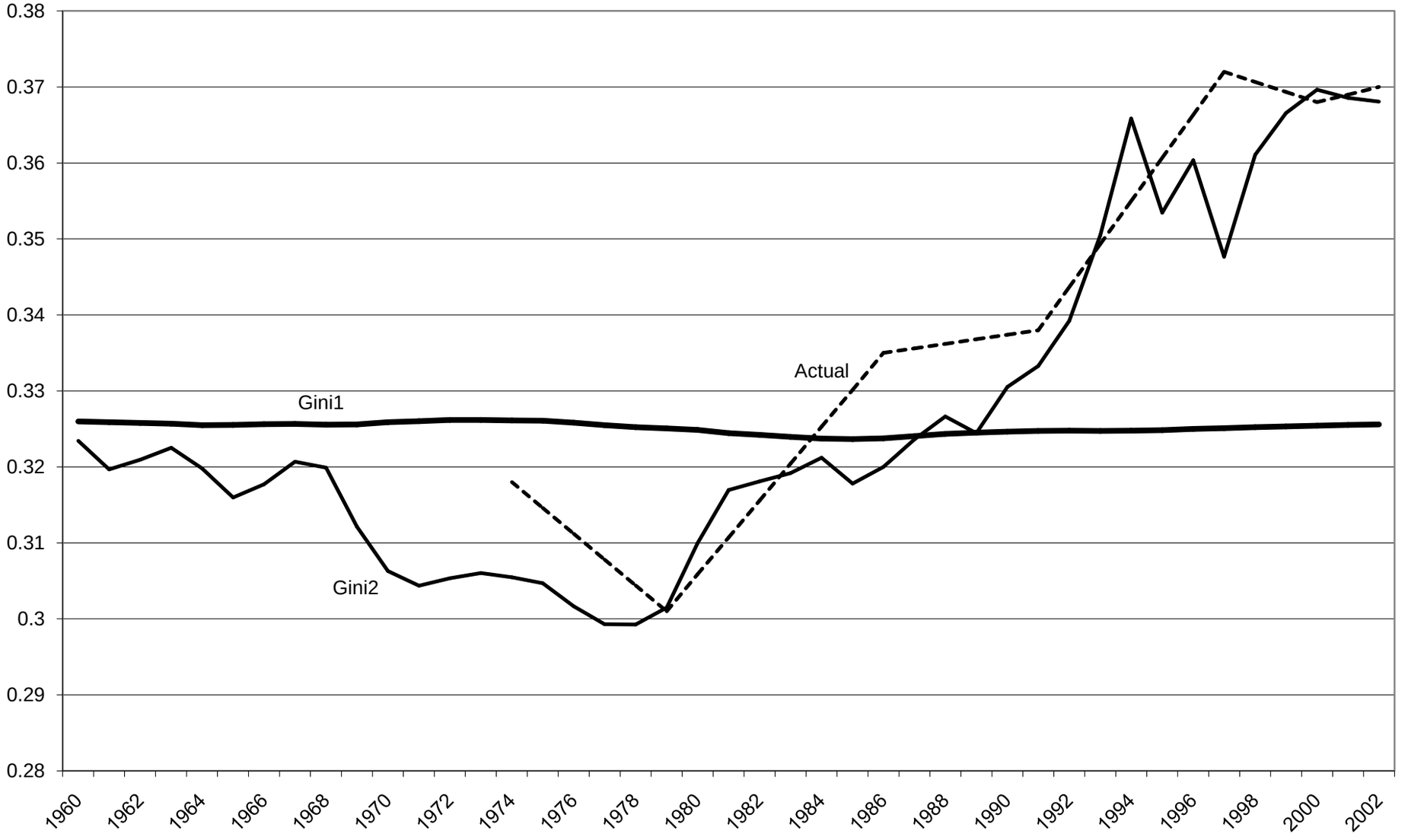

0.06
0.05
0.04
0.03
0.02
0.01
0
interest rate
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002


0.02
CA/GDP
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
1960
2002
PCR/GDP
0.5
0.7
0.9
1.1
1.3
1.5
1.7
1.9
2.1
2.3


0.39
0.37
0.35
0.33
0.31
0.29
0.27
0.25
Actual
Simulated
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002


0.35
0.3
0.25
0.2
0.15
Open(aA=5)
Closed
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002


0.38
0.37
0.36
0.35
0.34
0.33
0.32
0.31
0.3
0.29
0.28
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
aA=4.5
aA=5
aA=5.5
aA=6
Actual


0.38
0.37
0.36
0.35
0.34
0.33
0.32
0.31
0.3
0.29
0.28
Actual
Gini1
Gini2
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002