

## **The Savings Behavior of East and West Germans – Theoretical Predictions and Empirical Evidence**

By Nicola Fuchs-Schündeln and Matthias Schündeln\*

### **Abstract**

We analyze whether the savings behavior of East and West Germans after German reunification can be explained by predictions from a life cycle consumption model. The life cycle hypothesis gives predictions for consumption and savings over the life cycle for a given expected income profile, taking retirement into account. Yet, for the East German population the economic environment changed dramatically and unexpectedly after German reunification, causing a reassessment of life cycle income and risk. In an empirical analysis, we find that the differences in savings behavior of East and West German age cohorts are in line with the life cycle hypothesis.

*JEL classification: D 91, E 21*

### **1. Introduction**

We analyze whether the savings behavior of East and West Germans after the German reunification in 1990 can be explained by the life cycle hypothesis. The reunification had a lasting impact on the German economy as a whole, but it especially meant a radical shift in the economic framework and economic institutions for East Germans. East Germans were hit by the reunification as an economic shock at a certain point during their life cycle, and had to reevaluate their consumption and savings decisions. Based on the life cycle hypothesis, we derive predictions for differences in the savings behavior during working life of East and West Germans after reunification, focusing on savings behavior of different cohorts.<sup>1</sup> Using data from the German Socio-

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<sup>1</sup> For a discussion of the savings behavior of Germans after retirement see Börsch-Supan et al. (2001a). Further, Börsch-Supan et al. (2001b) give a description of savings behavior of West Germans before and shortly after reunification.

Economic Panel (GSOEP), we provide evidence for the validity of these predictions with graphs and econometric analysis.

## 2. Predictions from the life cycle hypothesis

The life cycle hypothesis by Modigliani / Brumberg (1954) is the most commonly used framework for analyzing consumption and savings behavior. At the beginning of the life cycle, the household decides how much to consume and how much to save in every period of the life. The expected income path, expected changes in the family composition, and a retirement period are taken into account in the decision process. Once the individual has determined the optimal policy rules, she just carries them out over the course of her life. Only if new information arrives does reoptimization become necessary. Under certainty equivalence, if the interest rate equals the subjective rate of time preference, the individual would like to smooth consumption perfectly. In this case, a rising income profile over the working life followed by lower retirement income will generate a pattern of borrowing when young, accumulating wealth in middle age, and drawing down wealth when old.

Recent models of precautionary savings abstract from certainty equivalence and take labor income risk seriously (e.g. Carroll 1997). In these models, individuals save both for retirement and as a precaution against bad times. Young people face a high cumulative income risk over their life cycle and are typically liquidity constrained. They therefore want to build up a buffer stock of wealth in order to be able to smooth consumption in the case of a negative shock. Hence, it can be shown that incorporating precautionary motives into a life cycle model leads to a U-shaped path of the savings rate over the working life, instead of a steady increase in the savings rate (Browning / Lusardi 1996). This U-shaped path also arises if family composition is taken into account (Tobin 1967). Most young people enter the working life single, and then at some point get married and have children. While children are in the household, consumption needs of the household are higher and savings rates are low. After children leave the household, the savings rates start to rise again.

Unexpected changes in the underlying process of labor income, or in the institutional framework, make reoptimization during the life cycle necessary and can result in drastic shifts in the life cycle profiles of consumption and savings. German reunification in 1990 was not anticipated, and radically changed the economic framework for East Germans. We focus on changes in the expected future income paths, and changes in the institutional environment, such as changes in pension schemes. Both incomes and pensions of East Germans rose quickly and dramatically after reunification to a level close to West German incomes and pensions. Instead of considering the higher expected incomes and pensions, one can equivalently think of reunification as a negative

shock to wealth levels of East Germans compared to the wealth levels of West Germans. As a consequence, East German households needed to readjust their wealth levels through savings to accommodate these changes.

The life cycle hypothesis provides us with predictions for differences in savings behavior between West Germans, who did not experience this unexpected shift, and East Germans. In the GSOEP data, we estimate the average wealth holdings by East Germans in 1992 to be 43% of the average wealth holdings of West Germans (using income from interest and dividends to proxy for wealth). Consider an East and a West German household of a common cohort in 1990. While the West German household is carrying out its life cycle savings plan, the East German household has to reoptimize its decisions, given the new economic circumstances. Assuming that from 1990 on both face the same income path during working life and retirement, the East German household saves a larger proportion of its income in order to at least partially adjust its wealth holdings to the level of the West German household. The optimal wealth holdings of the East German household at the time of retirement are lower than that of the West German, but the optimal savings rate until retirement is higher. These effects will be larger the closer the household is to the retirement age, since older households have less time left to accumulate wealth before retirement.

Aggregating over individuals of different cohorts before retirement, the life cycle hypothesis also provides us with predictions for the average savings rate of East Germans in the working population. Because over the course of the 1990s more older people entered retirement and more younger people entered working life after German reunification, the difference between East and West German aggregate savings rates should become smaller, until the aggregate savings rates finally converge.<sup>2</sup>

### 3. The data

We use data from the German Socio-Economic Panel (GSOEP). This annual panel survey was started in 1984 and beginning from 1990 also covers the territory of the former German Democratic Republic. We use the 95% research

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<sup>2</sup> Note that the model outlined above relies on several simplifications. First, average income is still lower in East Germany than in West Germany, and average income risk is probably higher due to the higher unemployment rates. Second, we do not explicitly discuss inheritances and bequest motives. Third, since different occupations or educational groups face different slopes in the labor income path, predictions will vary slightly for different groups. Last, all consumption in this model is non-durable, while durable consumption purchases may play an important role. Especially immediately after reunification, durable goods purchases probably increased in East Germany, thereby temporarily suppressing savings rates.

sample of the Socio-Economic Panel and the survey rounds from 1992–2000. We start our analysis only in 1992 because the savings question that we use was only introduced that year. The savings and wealth data in the survey is recorded at the level of the household. To assign personal characteristics (e.g. education level) to a household, we use the information about the head of the household.

The survey has various subsamples and has been refreshed several times to adjust for attrition. For our analysis, we use data from subsamples A (people who lived in West Germany before 1990) and C (people who lived in the German Democratic Republic before 1990). We exclude subsamples that focus exclusively on foreigners and migrants (subsamples B, D, and F2), since these groups might have different savings and wealth accumulation motives due to return migration, transfers home, etc. Moreover, we exclude the refreshment samples E (starting in 1998) and F (starting in 2000), since we cannot determine unambiguously whether individuals in these subsamples lived in West or East Germany before 1990.

We focus on labor force participants. We exclude households whose head of household is retired but include households whose head is unemployed. Further, we eliminate from the sample households whose head serves an apprenticeship or is self-employed. We do this because it is difficult to disentangle household income from profits and private savings from accumulation of business capital for the latter group. Moreover, self-employed are not required to contribute to the compulsory pension system and might choose to accumulate retirement savings in private funds. Finally, for our graphical analysis we focus on households whose head is 65 years or younger at the time of the survey. The resulting sample contains 12,491 observations for West German households and 8,813 observations for East German households.<sup>3</sup> For the econometric analysis, to be able to define meaningful cohorts, we further drop households whose head is 60 years or older in 1992.

The dependent variable in our regressions is the positive savings ratio, i.e. positive savings out of disposable income. We identify the household net income and positive savings from direct survey questions.<sup>4</sup> Further, we construct a proxy for accumulated financial wealth using income from interest and dividends.<sup>5</sup> This measure represents net worth excluding wealth related to home

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<sup>3</sup> Note that, throughout the paper, when we talk about East Germans and West Germans, we relate to the residence before reunification, independent of the residence after 1990.

<sup>4</sup> Our savings measure refers only to financial savings, excluding real savings (e.g. by buying a house). The question reads: “Do you usually have an amount of money left over at the end of the month that you can save for larger purchases, emergency expenses or to acquire wealth? If yes, how much?”

<sup>5</sup> We use a question concerning income from interest and dividends to infer financial wealth. We calculate the average interest rate earned on financial assets based on

ownership. Wealth and income data are converted to year 2000 purchasing power.

## 4. Behavior of the savings ratios over time

### 4.1 Graphical analysis

First, we plot the average savings ratio over time for all individuals in the East and West samples. We include in this plot the time series of the savings rate of private households that is published by the Statistisches Bundesamt ("Stat. BA"), the Federal Statistical Agency (Statistisches Bundesamt 2002). For Germany as a whole, we note a downward trend in the savings ratio over the time period 1992–2000: the savings rate published by the Statistisches Bundesamt decreases from 13% to 9.9% over this period – a drop of 24%. The West Germans' savings ratio in 1992 is the same as in 2000, namely 9.8%. However, it oscillates between a high of 10.2% in 1993 and a low of 9.0% in 1999, corresponding to a drop of 12%. On the other hand, the East Germans' savings rate drops sharply during the observation period, from 13.6% in 1992 to 10.1% in 2000, a decline of 26%. The savings rates of East and West Germans clearly converge over time and differ only by 0.3 percentage points at the end of the observation period in our samples.

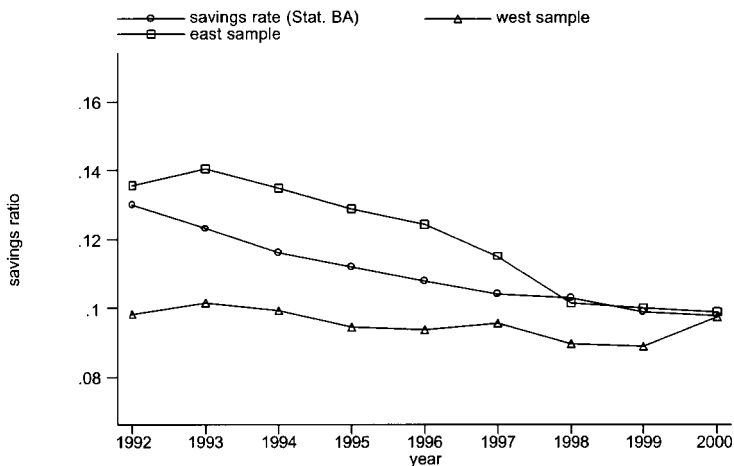


Figure 1: Yearly average savings ratio 1992–2000

average wealth portfolios and average rates on savings accounts, bonds and stocks in the respective years (Deutsche Bundesbank, various issues).

These findings are consistent with the predictions of the life-cycle hypothesis for the average savings ratio. After reunification, East Germans found themselves in a state of lower wealth holdings compared to West Germans and had to save more. Yet, as more older East Germans enter retirement and more younger East Germans, who experienced no shocks, enter working life over the course of the 1990s, the difference in the average savings rate between the East and West German samples narrows.

The life cycle hypothesis predicts that savings ratios are high at young age, low at middle age, and highest shortly before retirement. We investigate these predictions in the following graphs. For this purpose, we split the sample into four age cohorts. The first age cohort comprises individuals aged 20–30 in 1992, while the other cohorts are individuals aged 31–40, 41–50 and 51–60 in 1992. We show the results separately for West and East Germans.

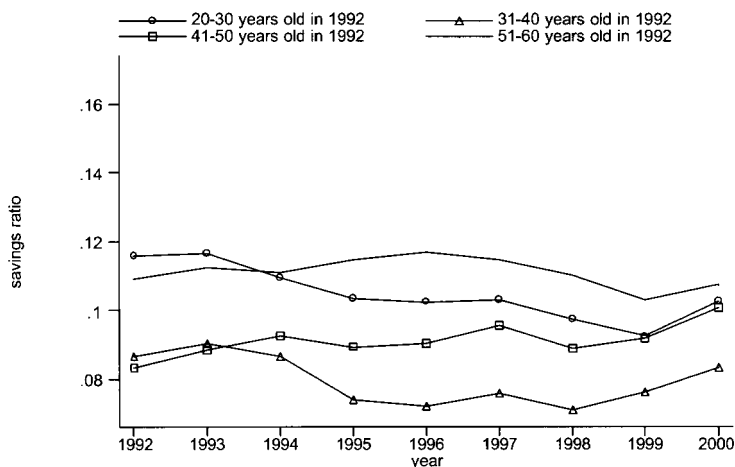


Figure 2: West German sample

The graph for the West German sample shows that indeed the youngest and oldest generations have higher savings ratios than the middle aged. Overall, the differences in the savings ratios are not very large, with the lowest savings ratio being 7.1% for the 31- to 40-year-olds, while the highest savings ratio is 11.7% for the oldest generation. The decline in the savings ratio over the time period 1993–1999 is mostly caused by the younger generations.

As outlined above, the predictions of the life cycle hypothesis for savings behavior of East Germans are different for different cohorts. The younger cohorts are starting their working life or are still very close to the start of their working life at the time of reunification. They almost start out at the same

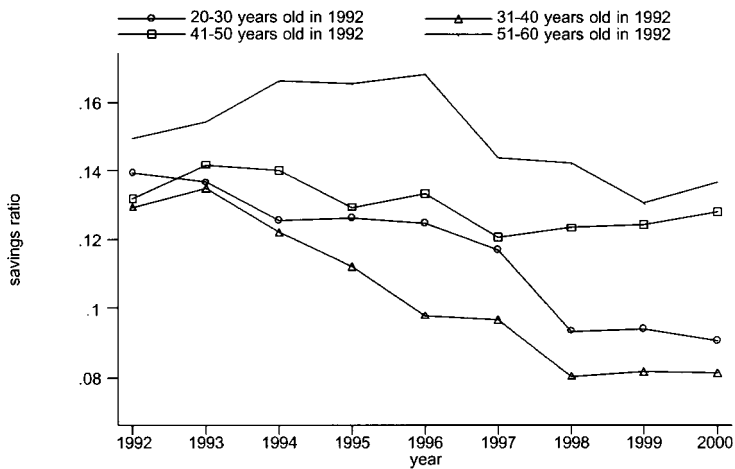


Figure 3: East German sample

wealth level as West Germans of the same cohort (neglecting inheritances). On the other hand, older cohorts have a much shorter time period left to accumulate wealth and should be saving much more than West German households of the same cohort.

In the graph for the East German sample, we observe that generally savings ratios for East Germans are much higher than for West Germans initially (i.e. in the first half of the sample period). In both subsamples the oldest age cohort, the 51- to 60-year-olds in 1992, saves the largest share of its income. However, in accordance with the life cycle hypothesis, this is much more pronounced for the East Germans than for the West Germans. While the cohort of 51- to 60-year-olds saves on average only slightly more than the cohort of the 20- to 30-year-olds for the West Germans, the oldest cohort clearly saves much more than all other cohorts in the East German sample. Further, the East German households in the second oldest age cohort, the 41- to 50-year-olds in 1992, are the cohort with the second highest savings ratio, and on average have a savings ratio almost 4 percentage points higher than their West German counterparts. At the end of the observation period, in the year 2000, the savings rates are still higher for East than for West Germans for the two oldest age cohorts, but lower for the youngest cohort and the same for the cohort of people aged 31 to 40 in 1992. Again these findings are consistent with the predictions of the life cycle hypothesis and a catching up behavior of East Germans. The pronounced decline in the savings ratio of the oldest cohort of East Germans over the 1990s might be due to attrition in our sample. Since we drop households whose head is older than 65 years from the sample, the proportions within this cohort shift towards comparatively younger people over time.

Since the optimal savings rates of those who were 50 years old in 1992 are lower than of those who were 60 years old, this leads to a decline in the savings ratio of this cohort over the 1990s.

## 4.2 Regression analysis

In this section, we analyze the data more closely, investigate the statistical significance of the findings of the last section, and allow for various other savings motives and relevant variables in a regression framework. Since the positive savings ratio is left-censored at zero, we estimate random-effects tobit models. Based on the life cycle hypothesis, we regress the savings ratio on age, age squared, and cohort dummies. Cohort dummies are included to see whether we can determine different cohort effects for East and West Germans. We define cohorts by their age in 1992 and drop households whose head is younger than 20 years or older than 60 years in 1992. The precautionary savings literature predicts that the savings ratio should be higher if an individual experiences a positive temporary income shock, but lower the more wealth an individual has already accumulated, and hence we include the logarithm of income and the wealth proxy as controls. We also control for family composition by including marital status of the household head, the number of individuals above age 16 in the household (adults), and the number of individuals less than or equal to age 16 living in the household (children). We also employ controls for residence in the eastern or western part of Germany in the observation year, and include year dummies. The omitted marital status is single or widowed. The omitted education categories are secondary schooling and no schooling. The omitted year is 1992.

We concentrate the discussion of results on the predictions of the life cycle hypothesis. Regarding the other controls we note that they mostly exhibit the expected signs<sup>6</sup> and reasonable sizes. The regression results confirm the results from the earlier graphical analysis. The negative and in absolute values increasing estimates for the year indicators between 1993 and 1999 confirm that there is a downward trend in the savings ratio over this time period, in the whole sample as well as separately for East and West Germans. The effect is much bigger for East Germans.

Consistent with the life cycle hypothesis, the coefficient on age is negative and on age squared positive in all samples, giving a U-shaped path of the savings ratio over the life cycle. Most of the coefficients on the cohort dummies are not significant in specifications (i), (iii) and (iv). Hence, it seems that age effects are in general more important than cohort effects to explain savings ratios in Germany. Yet, there is an important difference between the coeffi-

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<sup>6</sup> The noteworthy exception is a positive sign on wealth, a puzzling result reported not only in German data; for evidence for the US, see for example Carroll (2000).



Table 1

## Savings Rate Regressions for East and West Germans

| Dep. var.: $\frac{S^{\text{pos}}}{Y}$ | Total German population |           |        |           | West Germans |           | East Germans |           |
|---------------------------------------|-------------------------|-----------|--------|-----------|--------------|-----------|--------------|-----------|
|                                       | (i)                     |           | (ii)   |           | (iii)        |           | (iv)         |           |
|                                       | Coeff.                  | Std. Err. | Coeff. | Std. Err. | Coeff.       | Std. Err. | Coeff.       | Std. Err. |
| <i>Age Variables:</i>                 |                         |           |        |           |              |           |              |           |
| age                                   | -0.014                  | 0.002     | -0.012 | 0.002     | -0.013       | 0.002     | -0.014       | 0.003     |
| age sq. (*10 <sup>2</sup> )           | 0.017                   | 0.002     | 0.018  | 0.002     | 0.017        | 0.002     | 0.015        | 0.003     |
| cohort 31 – 40                        | -0.007                  | 0.009     | -0.037 | 0.011     | -0.019       | 0.011     | 0.013        | 0.014     |
| cohort 41 – 50                        | 0.003                   | 0.015     | -0.059 | 0.016     | -0.025       | 0.019     | 0.043        | 0.024     |
| cohort 51 – 60                        | -0.003                  | 0.021     | -0.093 | 0.023     | -0.042       | 0.027     | 0.052        | 0.033     |
| <i>Interaction Terms:</i>             |                         |           |        |           |              |           |              |           |
| age*eastsample                        |                         |           | -0.004 | 0.003     |              |           |              |           |
| age squared*eastsample                |                         |           | -0.003 | 0.003     |              |           |              |           |
| cohort 31 – 40*eastsample             |                         |           | 0.072  | 0.013     |              |           |              |           |
| cohort 41 – 50*eastsample             |                         |           | 0.146  | 0.017     |              |           |              |           |
| cohort 51 – 60*eastsample             |                         |           | 0.204  | 0.021     |              |           |              |           |
| eastsample                            |                         |           | 0.141  | 0.054     |              |           |              |           |
| <i>Other Controls:</i>                |                         |           |        |           |              |           |              |           |
| log(Y)                                | 0.116                   | 0.003     | 0.117  | 0.003     | 0.094        | 0.004     | 0.155        | 0.006     |
| wealth (*10 <sup>7</sup> )            | 0.642                   | 0.089     | 0.618  | 0.089     | 0.485        | 0.085     | 0.471        | 0.050     |
| married                               | -0.013                  | 0.004     | -0.015 | 0.004     | -0.008       | 0.004     | -0.034       | 0.008     |
| divorced                              | -0.040                  | 0.005     | -0.042 | 0.005     | -0.031       | 0.005     | -0.061       | 0.010     |
| adults (age > 16)                     | -0.018                  | 0.002     | -0.018 | 0.002     | -0.015       | 0.002     | -0.024       | 0.002     |
| children                              | -0.008                  | 0.002     | -0.009 | 0.002     | -0.009       | 0.002     | -0.011       | 0.003     |
| college                               | 0.062                   | 0.007     | 0.055  | 0.008     | 0.060        | 0.009     | 0.055        | 0.016     |
| vocational                            | 0.029                   | 0.006     | 0.028  | 0.006     | 0.031        | 0.007     | 0.032        | 0.015     |
| lives in west in survey year          | -0.046                  | 0.004     | -0.022 | 0.009     | 0.065        | 0.026     | -0.048       | 0.010     |
| <i>Year Dummies:</i>                  |                         |           |        |           |              |           |              |           |
| year = 1993                           | -0.002                  | 0.003     | -0.003 | 0.003     | -0.004       | 0.004     | -0.001       | 0.006     |
| year = 1994                           | -0.008                  | 0.004     | -0.009 | 0.004     | -0.005       | 0.004     | -0.015       | 0.006     |
| year = 1995                           | -0.018                  | 0.004     | -0.018 | 0.004     | -0.014       | 0.005     | -0.028       | 0.006     |
| year = 1996                           | -0.024                  | 0.004     | -0.025 | 0.004     | -0.016       | 0.005     | -0.041       | 0.007     |
| year = 1997                           | -0.026                  | 0.005     | -0.027 | 0.005     | -0.016       | 0.006     | -0.046       | 0.008     |
| year = 1998                           | -0.039                  | 0.005     | -0.040 | 0.005     | -0.026       | 0.007     | -0.066       | 0.009     |
| year = 1999                           | -0.044                  | 0.006     | -0.046 | 0.006     | -0.029       | 0.007     | -0.075       | 0.009     |
| year = 2000                           | -0.039                  | 0.006     | -0.041 | 0.007     | -0.023       | 0.008     | -0.073       | 0.010     |
| constant                              | -0.517                  | 0.038     | -0.611 | 0.045     | -0.488       | 0.054     | -0.810       | 0.067     |
| obs                                   | 19973                   |           | 19973  |           | 11701        |           | 8272         |           |
| log likelihood                        | 6081                    |           | 6138   |           | 4001         |           | 2276         |           |

cients on the cohort dummies for West Germans (iii) and East Germans (iv). For the West German sample, the coefficients on cohorts are negative and increasing in absolute size. Yet, for the East Germans, the older cohorts save more than the omitted cohort, the cohort of 20- to 30-year-olds. The second oldest cohort saves significantly more than the youngest cohort. These findings for East Germans are consistent with our predictions. In specification (ii), we include interactions between the East sample and all age and cohort variables into the regression in the full sample to test for differences between East and West samples more specifically. The interaction terms with age and age squared are not significant, indicating that the general life cycle savings patterns are the same for East and West Germans. Yet, the cohort effects now become highly significant. All interaction terms of the East sample dummy with the cohort effects are significant and positive, and increasing in the age of the cohort. This indicates that indeed East Germans saved more than West Germans in the 1990s, and that this difference was bigger the older the head of the household was at the time of reunification. These results confirm the predictions of the life cycle hypothesis derived above.

## 5. Conclusion

After German reunification, East German households found themselves confronted with different optimal wealth levels than the ones for which they had prepared. This was due to important changes in the economic environment, such as changes in their future income paths, and changes in the institutional environment, such as changes in pension schemes. East German households then needed to readjust their wealth levels to accommodate these changes. In this paper we demonstrate how the resulting savings behavior of East Germans differed from West Germans, using data from the GSOEP over the time period 1992–2000. We find evidence that both East and West Germans behave as the standard life cycle hypothesis predicts, and that the differences between both groups are consistent with the life cycle theory. In particular, we find that savings ratios are higher for East Germans than for West Germans, which is a consequence of East Germans' lower initial wealth levels. The difference is increasing in the age of the household head, since older households have less time to adjust their wealth levels before retirement. Over the period of the 1990s, the difference between East and West Germans' savings behavior diminishes, consistent with a convergence of East German households' wealth levels towards their optimal wealth levels. We confirm our results from the graphical analysis in a regression analysis that controls for various other savings motives and potential differences between East and West German households.

The paper demonstrates large differences between savings behavior of East and West Germans after German reunification. Using a standard life cycle

model, we show that the observed savings behavior is consistent with an adjustment process of East German households. Thus, we expect that there are no structural reasons that will make savings behavior different on a permanent basis. Rather, we expect that eventually the differences in savings behavior between East and West German households will vanish.

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