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Rentier premium and wealth inequality

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Abstract

Why do some people stay wealthy while others remain poor? Based on the empirical evidence of persistently heterogeneous returns on wealth across households, this study introduces the 'rentier premium' into the standard heterogeneous agents dynamic stochastic general equilibrium model. This tractable model shows that the rentier premium has acted as a key driver in rising wealth inequality in the United States since the 1980s.

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1 INTRODUCTION

The aggregate wealth of the US has rapidly expanded compared to national income since the early 1980s. According to the World Inequality Database (WID.world), the ratio of net national wealth to net national income remained stable at around 3.6 between 1960 and 1979. However, after the housing and equity booms, the ratio increased to around 5.3 in 2019. Concurrently, fast-growing wealth inequality has led to a renewed interest in the study of wealth distributions. As argued by a large number of studies (e.g. Piketty, 2014; Atkinson, 2015; Stiglitz, 2015a; Saez and Zucman, 2016), there seems to be a new set of stylised facts regarding the distributions of income and wealth for US households. Many of them are remarkably different from those at the centre of attention six decades ago.[1]

Based on the above empirical background, this study tries to answer the fundamental question: 'despite the rapid expansion of aggregate wealth, why do some people stay wealthy while others remain poor?' To address this question, I focus on finding a new mechanism that complimented the precautionary savings hypothesis to show the wealthy's high marginal propensity to save. That is, this study introduces the rentier premium into the canonical heterogeneous agents dynamic stochastic general equilibrium (DSGE) model.

2 EMPIRICAL MOTIVATION FOR RENTIER PREMIUM

This study has defined rentier premium as the gap between the return on asset ownership and the return on capital used for the production of real output in a perfectly competitive market. To figure out this definition, we need to first understand two concepts: rents and wealth residual. First, rents are defined as 'that part of the payment to an owner of resources over and above that which those resources could command in any alternative use' (Buchanan, 1980); that is, it is 'the receipt in excess of the owner's opportunity cost of the resources' (Chang, 1994). Second, wealth and capital are distinctly different concepts. If wealth is equated with capital, the increase in wealth should be associated with a decline in the return to capital and an increase in real wages. However, this hypothesis is contradicted by the actual US data: the increase in the wealth-income ratio and the stagnation of median real wages during the past three decades (e.g., Eggertsson et al., 2018). Hence, there might be an unexplained causal factor of the increase in the wealth-income ratio, referred to as 'wealth residual' (Stiglitz, 2015a).

On top of Stiglitz (2015a)'s theoretical perspective, this paper is, I believe, the first to measure wealth residual by combining the Financial Accounts of the Federal Reserve (FED) and the Fixed Assets Accounts of the Bureau of Economic Analysis (BEA). First, household wealth is calculated by the market value of aggregate assets, net of their liabilities, from the Financial Accounts Table B.1 (FED code: FL152090005).[2] Second, capital is calculated by the current-cost net stock of fixed assets from the Fixed Assets Table 1.1 (BEA code: K1PTOTL1ES000).[3]

[1] Among the old stylised facts (e.g. Kaldor, 1961), the key elements were the constancy of the capital-output ratio and the relative factor shares.

[2] According to the FED, wealth consists of nonfinancial wealth and financial wealth. Nonfinancial wealth includes land, structures, machines and patent rights. To a large extent, households' financial position ultimately represents a claim on the nonfinancial assets of corporate business or government. Since financial wealth nets to zero across sectors in an aggregate sense, aggregate household wealth at a particular time can be represented as the sum of all of its non-financial assets (Holmquist and McIntosh, 2015).

[3] According to the BEA, buildings, machines, software, and even the intellectual property product (e.g. creation of a song) can be fixed assets, if they are used for a year or more in the production of goods or services. Houses and apartments are also included, even if the owner lives there.

Accordingly, wealth residual is naturally calculated by the gap between household wealth and capital. Next, the upsurge of wealth residual is being driven by either land[4] or rent-related finance (i.e., some financial assets that is not linked to capital or land) or both. I estimate a portion of land in wealth residual by using a concept of Davis and Heathcote (2007), who see that a house can be seen as a bundle comprising a reproducible tangible structure and a non-reproducible plot of land. Since the structure can be priced explicitly as the replacement-cost, the residuals are assumed to be the value of a home location[5] – referred to as 'scarcity rents' that are evidently capitalised in nonfinancial assets, as argued by Fagereng et al. (2019), Piketty (2014), Rognlie (2015) and Stiglitz (2015a,b).

In this context, I calculate wealth residual values for land by subtracting the replacement-cost value of structures from the market value of real estate from the Financial Accounts Table B.101 (FED code: LM155035005, LM155012605 and LM165013665). Rent-related finance is then naturally calculated as the gap between wealth residual and land – referred to as 'monopoly rents' that are unobtrusively capitalised in financial assets, as argued by Stiglitz (2015a).

Table 1 shows the result for measuring wealth residual for the US during 1978-2018. Most notably, in 2018, roughly 40% of wealth in US households was not related to production of real output but was instead associated with rents from wealth residual. During the last four decades, wealth residual has increased by 59.3 times, while capital has increased by only 8.7 times. As a result, the ratio of wealth residual to total wealth in 2018 (39.7%) was much larger than 8.8% in 1978, implying that not all households' finances lead to productive investment. In addition, by far the largest contributor to the increase in the wealth-income ratio from 409.4% in 1978 to 607.6% in 2018 is rent-related finance, while land was a crucial source of wealth residual until the Subprime mortgage crisis of 2007. Most importantly, if we look at the co-evolution of top wealth inequality and growing wealth residual, the ownership of wealth residual may be a source of the returns over and above the return on capital – that is, 'rentier premium'.

TABLE 1
Wealth residual in the United States, 1978-2018

(Trillions of dollars, amounts outstanding end of period)

	1978(E)	1988	1998	2008	2018(F)	F/E
Wealth (A)	8.0	19.8	38.8	58.1	104.3	13.1
Capital (B)	7.3	15.2	24.5	46.0	62.9	8.7
Wealth residual (C=A-B)	0.7	4.6	14.3	12.1	41.4	59.3
Land (D)	0.5	2.6	3.4	5.0	8.9	16.5
Rent-related finance (C-D)	0.2	2.0	10.9	7.1	32.5	207.5
Wealth residual ratio (C/A, %)	8.8	23.1	36.8	20.8	39.7	4.5
Wealth-income ratio (%)	409.4	455.1	498.0	526.8	607.6	1.5

Note: Wealth-income ratio is the ratio of households' net worth as a percentage of personal income.
Source: The author's own estimation based on the Federal Reserve and the Bureau of Economic Analysis

[4]Nonfinancial assets consist of real estate and consumer durables. Since consumer durables are solely calculated by the replacement-cost value, there must be no wealth residual for consumer durables.

[5]If housing were simply a manufactured good, the price of housing would be determined by construction costs, and housing prices would increase at roughly the same rate as the price of other goods. But since housing has a valuable location component that is in limited supply, an increase in the demand for housing can link directly to increases in the value of good locations.

A question naturally arises from the above data: who gains (or losses) from the upsurge of wealth residual? I attempt to find a clue from the Distributional National Accounts (DNAs) compiled by Piketty et al. (2018).[6] By combining Table B2d, B3, E2, E2b and E3 of this statistic, I estimate the average income accruing to labour and capital, and the average wealth for each asset composition – equities, non-corporate business assets, real estate, fixed income claims and pensions – held by the bottom 50%, the middle 40%, the top 10% and the top 1% of the US households. All our data are expressed in constant 2018 dollars to adjust for inflation, using the national income deflator.

Table 2 describes the estimated portfolio of the US households in 2016. It clearly shows that households at the top 10% make a living through all income sources with about 2.3 millions of net worth while households at the bottom 50% significantly depend on labour income with little net worth, as in Mian et al. (2020). If we look at the top 1%, they earn a huge amount of capital income mostly from fixed income claims and equities unlike the middle 40% who significantly rely on pensions and real estate.

TABLE 2
Households' portfolio (pre-tax, pre-transfer) in the Data, 2016

(Thousands of dollars, %)

	Top 1%		Top 10%		Middle 40%		Bottom 50%	
Labour income	568.3	(42.1)	184.7	(57.6)	58.8	(81.8)	17.3	(93.4)
Capital income	781.7	(57.9)	136.0	(42.4)	13.1	(18.2)	1.2	(6.6)
Total income	1,350.0	(100.0)	320.7	(100.0)	71.9	(100.0)	18.5	(100.0)
Equities	3,887.7	(32.2)	564.3	(24.0)	16.3	(7.0)	1.7	(70.4)
Business	1,454.3	(12.0)	267.3	(11.4)	24.3	(10.4)	1.4	(56.7)
Real estate	1,127.6	(9.3)	389.1	(16.5)	68.3	(29.3)	1.8	(76.8)
Fixed claims	4,042.5	(33.5)	556.6	(23.6)	-1.8	(-0.8)	-15.4	(-639.8)
Pensions	1,564.7	(13.0)	577.3	(24.5)	126.2	(54.1)	12.8	(535.9)
Total wealth	12,076.8	(100.0)	2,354.6	(100.0)	233.4	(100.0)	2.4	(100.0)

Notes: The share of each component is in parenthesis. Equities, corporate equities including S-corporation and money market shares; Business, non-corporate business assets including sole proprietorships, farms, partnerships, and intellectual property products; Real estate, owner- and tenant- occupied housing, net of mortgage debt; Fixed claims, currency, deposits, bonds, and other interest-paying assets, net of non-mortgage debts; and Pensions, pensions and insurances; All our data are expressed in constant 2018 dollars to adjust for inflation.
Source: The author's estimation based on the Distributional National Accounts (Piketty et al., 2018)

Furthermore, based on historical data of the DNAs, I have estimated the return on the portfolio of each wealth group over the period of 1962-2016 as $r_t^g = \sum_i A_{i,t}^g r_{i,t} / \sum_i A_{i,t}^g$ where $A_{i,t}^g$ refers to the amount of asset i held by wealth group g at t and $r_{i,t}$ refers to the return on asset i at t. Based on Chang (1994)'s definition on rents, I then define the gap between the return on the portfolio of the top 1% and the risk-free rate, measured by the 3-month treasury-bill rate from the Federal Reserve Bank at St. Louis, as 'rentier premium'. We can further decompose this rentier premium as top 1% premium, top 10% premium and middle 40% premium. For instance, top 1% premium refers to the gap between the return on the portfolio of the top 1% and that of the top 10%. Table 3 shows that the estimated average return on the portfolio of the top 1% over the entire period is 9.48%, which is 4.73 percentage points higher than the risk-free rate (4.75%). In addition, rentier premium has increased from 1.81% in 1980-89 to 6.84% in 2010-16. The decomposition of rentier premium indicates that the premium becomes larger, as those who belong to the wealthier group. Furthermore, top 1% premium and top 10%

[6]Data files and replication files are available at http://gabriel-zucmann.eu.usdina/.

premium have declined from 1.87% and 2.11% in 1962-69 to 0.18% and 0.08% in 2010-16, respectively, while middle 40% premium has increased from 0.12% in 1980-89 to 6.58% in 2010-16. These results imply that those who had enough funds to invest high-return products during 1980-2016, their wealth have been increased geometrically; however, those who did not (i.e., the bottom 50%) have remained poor.[7]

TABLE 3
Rentier premium in the United States, 1962-2016

(%, %p)

	62-69	70-79	80-89	90-99	00-09	10-16	62-16
Return on $P_{T1\%}$ (A)	11.38	11.51	10.35	8.92	7.27	6.99	9.48
Return on $P_{T10\%}$ (B)	9.51	10.15	9.80	8.46	6.88	6.81	8.68
Return on $P_{M40\%}$ (C)	7.40	8.46	8.66	7.78	6.32	6.73	7.62
Risk-free rate (D)	4.79	6.55	8.54	4.75	2.36	0.15	4.75
Top 1% premium (=A-B)	1.87	1.36	0.55	0.46	0.39	0.18	0.80
Top 10% premium (=B-C)	2.11	1.69	1.14	0.68	0.56	0.08	1.06
Middle 40% premium (=C-D)	2.61	1.91	0.12	3.03	3.96	6.58	2.87
Rentier premium (=A-D)	6.59	4.96	1.81	4.17	4.91	6.84	4.73

Notes: $P_{T1\%}$, $P_{T10\%}$ and $P_{M40\%}$ refer to the portfolio of the top 1%, the top 10% and the middle 40%, respectively. The risk-free rate is measured by 3-month treasury bill rate.
Source: The author's estimation based on the Distributional National Accounts (Piketty et al., 2018)

3 THE MODEL

I build a tractable DSGE model with heterogeneous agents based on the empirical evidence presented in the previous section. First of all, I make the premise that a household's wealth consist of both capital and wealth residual. Wealth residual may create heterogeneous rentier premium across asset owners. For certain wealth residual with fixed supply (e.g. land), the aggregate return on this across households is zero. Thus, the emergence of congestion and crowding for wealth residual can create the increase in 'scarcity rents' (i.e. it will look lie arms races), leading to the upsurge of wealth residual (Stiglitz, 2015b; Hirsch, 1977).

More specifically, if an agent belongs to the rentier class, (s)he may choose to invest her resources in two different investment technologies, as in Lusardi et al. (2017). The first is a basic technique (e.g. a checking account) that yields a certain (but potentially low) risk-free return that is flowed to capital, representing the expected return for everyone without any financial know-how. The second is a more sophisticated but risky technique that enables a rentier to receive a higher expected return from wealth residual. As a result, rentier premium risk may play a fundamental role in generating wealth concentration that far exceeds the earnings concentration because the rate of return on wealth accumulates multiplicatively over time, as similarly argued by Aoki and Nirei (2016), Aoki and Nirei (2017), and Benhabib et al. (2017).

Two key forces that generate wealth inequality are (i) partially insurable income risk with

[7] According to the DNAs, the rapid growth of wealth residual was beneficial to the top wealthy, especially in equities and non-corporate business assets for the top 0.01% and real estate for the top 10%. Even though the bottom 50% are insulated from the change in risk-free rate of interest, it would be hardly possible for them to attain capital gains from the upsurge of wealth residual during the last four decades.

different degrees of precautionary savings that all individuals face ("within-class inequality") and (ii) the innate difference in asset ownership between the rentier class and the working class combined with rentier premium ("between-class inequality"). The remaining setup follows the standard heterogeneous agent DSGE model with aggregate uncertainty and incomplete markets (e.g. Benhabib et al., 2015).[8] The formal description of the model, optimal behaviour and equilibrium, solution methods, and calibration are presented in Online Appendix 1–4.[9]

4 RESULTS

The purpose of our quantitative analysis is to numerically assess the impact of the centrifugal and centripetal forces in labour income, capital income and rentier premium on wealth distribution. These quantitative exercises require us to firstly calibrate the theoretical model.[10] Once parameters are calibrated and the steady state is approximated, this study calculates through simulation the following outcomes of interest: the associated Gini coefficients, the Lorenz curves, and distribution of wealth. For simulation purposes, I use 10,000 households and set their initial wealth to be completely uniform within their classes. More specifically, 7,500 households start with the steady-state assets, while the remaining households begin with zero assets. I then simulate a series of three shocks using a random number generator from a normal distribution and obtain 1,000 draws.

After the model is simulated, I use the outcomes as a measurement tool for the following question: how far can we go in explaining wealth inequality when different histories of labour earnings risk are the only source of heterogeneity among households (denoted "Benchmark"), as in Aiyagari (1994)? The typical answer is that this Aiyagari-type model generates too much asset holdings at the bottom and too little at the top so that the wealth Gini is around 0.27, which is much smaller than the actual value (0.86) in 2014. Therefore, this model needs to be modified by either introducing an extra incentive for the wealthy to accumulate wealth or reducing an incentive for the poor to save for self-insurance purposes (or both). In addition, to generate an extremely skewed right tail of wealth distribution, it seems necessary to make the wealthy have higher propensities to save, give them higher returns on saving than the Aiyagari-type model, or even combine both solutions.

In this respect, this study presents a new mechanism in generating wealth inequality by simulating based on the following three models: (i) innate difference in asset ownership ("Model 1"), (ii) heterogeneity in rentier premium ("Model 2") to generate heterogeneous returns on wealth, and (iii) heterogeneity in rentier premium with a fat-tailed distribution of asset market returns ("Model 3") to reflect the non-normality of asset market returns in reality. Especially, the simulation with non-normality of asset market returns is constructed to create a realisation of very high earnings, which occurs with a very low probability in the so-called "awesome state", as in Castaneda et al. (2003) and Kindermann and Krueger (2014), to be consistent with the wealthy class's extraordinarily high propensity to save. Conventional asset allocation framework typically make a range of assumptions about the normality of asset returns and the

[8]The standard incomplete-markets models predict that saving rates are either independent of or decreasing with wealth because of the $\beta R < 1$ condition, where β is the discount factor and R is the (gross) risk-free rate (e.g., Benhabib and Bisin, 2018; Stachurski and Toda, 2019) even though precise evidence on this is missing until now, leaving us with an open empirical question (Fagereng et al., 2019).

[9]This study combines the first-order perturbation method and the explicit aggregation algorithm (e.g., den Haan and Rendahl, 2010; den Haan, 2009; Preston and Roca, 2007).

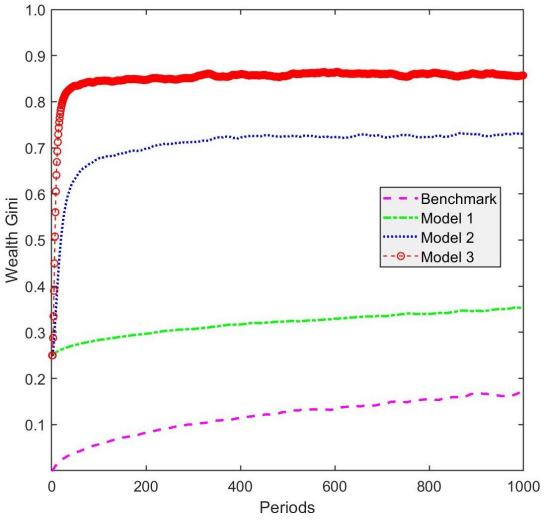
[10]The calibration follows the standard heterogeneous agents literature (e.g., Hubmer et al., 2016). The values of structure parameters are chosen to be consistent with aggregate features of the US economy after the early 1980s (e.g., Mehra and Prescott, 1985), while those of the stochastic process parameters are calibrated to fit the data.

returns are independent from period to period. But since it is empirically not true, to generate the awesome state, I simulate a series of rentier premium shocks using a random number generator from a *t* location-scale distribution, fit to the actual fat-tailed distribution of asset market returns of the US during the 1984-2013 period recompiled by Cao and Luo (2017).

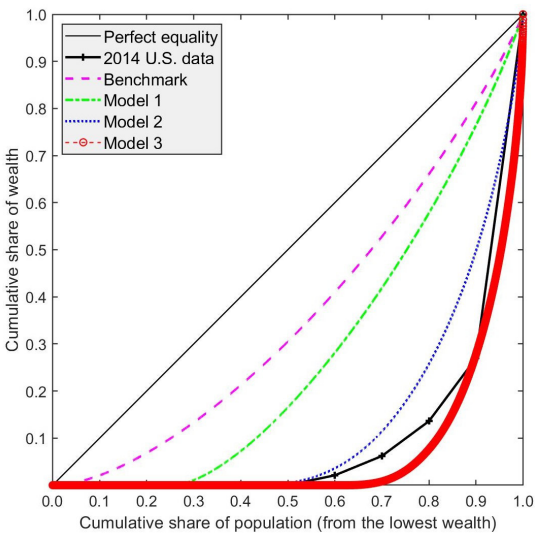
Figure 1 plots the evolution of the wealth Gini and the Lorenz curve for wealth. It reports that my model succeeds in generating empirically plausible degrees of wealth inequality and shows two implications. First, if we exclude heterogeneity in rentier premium, as in the Benchmark model and Model 1, the wealth Gini clearly depicts a very slow convergence to the new steady state. However, once we allow the stochastic process of rentier premium, as in Model 2 and Model 3, it generates a very fast convergence to the new steady state of the wealth Gini. This is consistent with the work of Gabaix et al. (2016), who argues that persistent heterogeneity in returns is necessary for models to account not only for extreme wealth concentration but also for the speed of change of wealth concentration observed in the data. Second, after the convergence, the degree of wealth inequality becomes worse, such that it is close to the actual distribution, as in Model 2 and Model 3. Nevertheless, if we assume only the rentier premium risk, as in Model 2, it predicts somewhat too a low concentration in the extreme upper tail of the wealth distribution and too a high concentration in the middle, compared to the actual data. These shortcomings reflect the restrictions of the symmetric normal distribution that has been imposed upon the rentier premium shock in Model 2. In this respect, Model 3 that reflects the fat-tailed distribution of asset market returns best mimics the actual wealth distribution.

FIGURE 1
Gini coefficients and Lorenz curves

(a) Evolution of wealth Gini



(b) Lorenz curves for wealth



Notes: US data – the World Inequality Database; Benchmark – heterogeneity in labour productivity; Model 1 – plus innate difference in asset ownership; Model 2 – plus heterogeneity in rentier premium; Model 3 – plus non-normality of asset market returns.

The resulting stationary wealth distribution is described in Table 4. The first line refers to the 2014 US data from the WID.world. It shows that wealth is highly unevenly distributed: the wealth Gini is 0.86 and the wealthiest 10% of households hold 73 percent of the net worth, while the poorest 50% hold almost zero. The second line of data refers to the outcomes from Benchmark model that replicates Aiyagari (1994) with an aggregate TFP shock, while the third line of data refers to the outcomes from Model 1, which assumes the inborn difference in asset

ownership under the Aiyagari-type economy. Comparing these lines makes it clear that the innate difference in asset ownership itself generates higher wealth inequality (0.45 in Model 1 compared to 0.27 in Benchmark), but it is still far below the actual value (0.86).

The fourth line of data refers to the outcomes from Model 2, which adds heterogeneity in rentier premium to Model 1, while the last line of data refers to the outcomes from Model 3, which introduces the non-normality of asset market returns into Model 2. Comparing these lines makes it obvious that Model 3 comes closest to matching both the concentration of wealth in the hands of the wealthy few and the main features of wealth distribution in the data, including the wealth Gini. For instance, in Model 3, the wealthiest 10% of households hold 73 percent of net worth, while the poorest 50% hold almost zero, and the wealth Gini is 0.86. My model also replicates the fact that almost a quarter of households hold non-positive wealth, close to 20-30 percent in the data, unlike the zero percent result found in the Aiyagari-type model.

TABLE 4
Wealth distribution: models and data

percentage of net worth held by			wealth	share of	fraction of
top 10%	middle 40%	bottom 50%	Gini	top 5%	wealth ≤ 0
2014 US data– WID.world					
73	27	0	0.86	60	20-30
Benchmark– heterogeneity in labour productivity ($\sigma^{rp}=0$, $\sigma^{e}>0$, $\lambda \simeq 1$)					
19	51	30	0.27	10	0
Model 1– plus innate difference in asset ownership ($\sigma^{rp}=0$, $\sigma^{e}>0$, $\lambda=0.75$)					
24	59	17	0.45	13	25
Model 2– plus heterogeneity in rentier premium ($\sigma^{rp}>0$, $\sigma^{e}>0$, $\lambda=0.75$)					
50	50	0	0.73	32	25
Model 3– plus non-normality of asset market returns ($\sigma^{rp}\gg 0$, $\sigma^{e}\gg 0$, $\lambda=0.75$)					
73	27	0	0.86	51	25

5 CONCLUSION

This study aims to help us better explain the new stylised facts by incorporating both precautionary savings (the so-called "thrift") and the inborn difference in asset ownership combined with rentier premium (the so-called "exploitation"). When an idiosyncratic labour earnings risk is the only source of heterogeneity, the model predicts far less cross-sectional dispersion and right-hand-side skewness than the actual US data (e.g. Benhabib and Bisin, 2018). In short, by paraphrasing a famous quote from Malthus (1798), we can predict a grim future, as capital gains would increase geometrically, but labour income would only grow arithmetically, which would result in extreme wealth concentration, unless the government enforces 'rebalancing rules' to transfer wealth from the top decile to the bottom decile.

Given that my model shows that the reniter premium plays an important role in exacerbating wealth inequality, an important next step of inquiry is to show more explicitly how the rentier premium relates to excess returns arising in standard portfolio choice models (e.g. Kaplan and Violante, 2014). For instance, we can decompose the rentier premium into four parts– differences in time-varying observable characteristics (e.g. risk exposure), transitory variations (e.g. luck), persistent components (e.g. ability) or (monopoly and scaricty) rents.

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