The distributional consequences of rent seeking*

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Abstract

We analyse the distributional effects of rent seeking via the financial sector in a model calibrated to US data. Rent seeking implies a misallocation of resources that increases wealth inequality among non rent seekers and for the whole economy. A deterioration in institutional quality implying more rent seeking leads to welfare losses for non rent seekers, especially for those with higher earnings and initial wealth, because they are most affected by the deterioration of the aggregate economy. On the other hand, welfare gains are larger for rent seekers with higher earnings and wealth, who have an increased resource extraction capacity.

Keywords: wealth distribution; rent seeking; conditional welfare changes
JEL Classification: D31, E02, H10

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1 Introduction

The importance of institutional quality for economic outcomes is widely accepted.[1] Recently, the literature has highlighted the role of the quality of institutions governing the financial sector, regarding activities to acquire influence (e.g. lobbying) and so extract extra rents (e.g. Igan *et al.* (2012, 2017), Stiglitz (2012), Mazzucato (2018) and Igan and Lambert (2019)). Rent seeking activities imply social costs, efficiency losses and poor macroeconomic performance.[2] In addition, when households are heterogeneous, rent seeking activities can have distributional implications affecting inequality (e.g. Chakraborty and Dabla-Norris (2006), Acemoglu *et al.* (2015), Chaturvedi (2017)). Inequality is also related to the financial sector via market incompleteness, which links idiosyncratic income shocks to wealth inequality in a rich literature since Bewley (1986), Huggett (1993) and Aiyagari (1994).

This paper examines the effects of rent seeking, via the financial sector, on wealth inequality and the distribution of implied welfare gains/losses across the population, employing a model of incomplete financial markets. In this model, in addition to differences in earnings due to idiosyncratic shocks, households' incomes and wealth can differ because of Tullock-type rent seeking competition via the financial market. In particular, weak exogenous institutions create a contestable prize or a common pool, which is comprised of a proportion of aggregate savings. Households (or a subset of them) can then compete with each other for a share of this prize in a Tullock (1980) type rent-seeking contest. The quantity of extracted resources increases with one's wealth relative to the aggregate wealth of rent seekers. However, rent seeking comes at a private cost; each household needs to spend part of the proceeds from rent seeking as fees to the rent seeking intermediation sector, which captures the services of law, financial, or lobbying firms that facilitate the extraction of rents. Rent seeking intermediation firms need to utilise a share of the economy's labour force to provide these services. At the household level, the cost of these services and the contestable prize are taken as given. In general equilibrium, however, rent seeking reduces capital and labour available for productive uses, and this affects prices and leads to a deterioration of aggregate outcomes.

It is recognised that rent-seeking competition favours elites (see, e.g. the literature reviewed in Acemoglu *et al.* (2015)) that are typically associated with higher socio-political power and relative wealth. For example, they may have a better insider position in financial markets. Therefore, we allow for the possibility that only a subset of the population extract resources via the rent seeking competition and let this group (or class) of rent seekers be defined by conditions that reflect non-economic, socio-political factors or by relative wealth. The former implies an exogenous determination of the rent seeking class (a form of exclusive rent seeking), whereas in the latter, this group is endogenously determined, and in particular, only those with high enough assets can benefit from rent seeking (a form of inclusive rent seeking).

We calibrate the model to the US, using measures of financial intermediation costs and the share of the labour force working in occupations that research has linked to rent

[1] See, e.g. North (1990), Hall and Jones (1999), Persson and Tabellini (2000), Drazen (2000), Dixit (2004), Rodrik *et al.* (2004), Acemoglu (2009), Besley and Persson (2009), Besley and Ghatak (2010), Acemoglu and Robinson (2019) and many others.

[2] See, e.g. Tullock (1967, 1980), North (1990), Murphy *et al.* (1991), Drazen (2000), Mueller (2003), Hillman (2009), Esteban and Ray (2011), Acemoglu and Robinson (2019) and many others.

seeking intermediation. When the population fraction with access to benefits from rent seeking is set exogenously, we assume that its size is 10%. This is motivated by the proportion of elementary and secondary school-aged children enrolled in private schools (see NCES (2019)).[3] When this fraction is defined endogenously based on relative wealth, it is motivated by empirical evidence that 10% of the population holds more than 90% of the financial assets in the US (see Kuhn *et al.* (2020)). We will also present results from a calibration of the model that implies that everyone belongs to the rent seeking class, without any barriers to rent seeking, to contextualise the importance of such barriers. To identify winners and losers of rent seeking, we start from a baseline economy without rent seeking and then study the aggregate and distributional implications of a gradual and deterministic deterioration in institutional quality.

The results suggest that a worsening of institutional quality implies more rent seeking activity and wealth inequality, consistent with the relationships we observe in the data and study in more detail in Section 2. The potential extra income from rent seeking stimulates household savings and wealth accumulation for the group of rent seekers, reducing the relative importance of stochastic earnings on wealth accumulation. In particular, the impact of variation in earnings on variation in wealth is reduced, which implies lower wealth inequality among rent seekers. However, rent seeking also diverts resources away from productive activities, which, in general equilibrium, worsens aggregate outcomes, reducing individuals' labour and asset income and incentives to save through a lower market return to savings. This general equilibrium effect discourages personal savings and reduces asset accumulation, increasing the impact of the variation in earnings on the variation in wealth across households. Non rent seekers are only exposed to this adverse effect so that wealth inequality within them increases. For rent seekers, the general equilibrium effect works in the opposite direction relative to the direct effect from rent seeking, so that the final outcome on wealth inequality among them depends on a quantitative evaluation of the strength of these effects. In our calibration to the US economy, we find that a deterioration in institutional quality implying an increase in rent seeking leads to an increase in overall wealth inequality, an increase in inequality among non-rent seekers and a decrease in inequality among rent seekers.

Under exogenously determined rent seeking classes, rent seekers enjoy welfare gains, and non rent seekers welfare losses. Our findings also indicate that the benefits and costs associated with rent seeking are not distributed equally. On the one hand, the biggest welfare losses from the increase in rent seeking opportunities are for those with higher earnings and initial wealth who are excluded from rent seeking because they are most affected by the deterioration of the aggregate economy. On the other hand, welfare gains are higher for rent seekers with higher earnings and initial wealth because they have an increased capacity to extract resources. Despite convergence in terms of wealth among rent seekers in the stationary equilibrium, rent seekers with lower initial wealth have lower welfare gains from increases in rent seeking activity; starting from lower wealth, they extract lower resources via the rent seeking competition in the transition to the new stationary equilibrium. Under endogenously determined rent seeking classes, rent seeking implies welfare losses for everyone due to the general equilibrium distortions. Taken together, our results imply that a reform to improve institutional quality to reduce

[3]The link between the education of the offspring of the elite and social immobility, and its relation to persistence of elites, has been analysed across social sciences (see, e.g. Khan (2012), Bukodi and Goldthorpe (2018), and Milanovic (2019).

rent seeking would benefit everyone if rent seeking were inclusive. However, when rent seeking is exclusive, households in the rent seeking class would become worse off. If we accept that political elites also have a more considerable influence in the design of economic institutions (see, e.g. Bonica *et al.* (2013) and Milanovic (2019)), our results may provide an explanation for the persistence of socially inefficient institutions that permit rent preservation.

The rest of the paper is organised as follows. After contextualising our work relative to the existing research and empirical evidence in Section 2, in Section 3, we set out an incomplete markets heterogeneous agents model with financial rent seeking and discuss model predictions. Then, in Section 4, we analyse the effects of rent seeking on wealth and welfare inequality, and we discuss conclusions in Section 5. In an online Appendix, we provide additional information on the data and technical material and a simplified version of the model with an analytical solution that illustrates the importance of the general equilibrium effects.

2 Empirical motivation and literature

This section discusses existing research and data that provide the background to study the link between inequality, rent seeking, and rent seeking intermediation, with a focus on financial markets.

2.1 Rent seeking and intermediation

Rent seeking is broadly defined as the socially costly pursuit of income and wealth transfers (see, e.g. Drazen (2000, ch. 8) and Hillman (2009, ch. 2)). A prerequisite of rent seeking is an institutional failure in the form of poorly defined and protected property rights [4] that allows the creation of common pools or contestable prizes, which, in turn, incentivise self-interested agents to participate in a Tullock-type rent seeking competition. All this implies a misallocation of resources so that the society incurs productivity and welfare losses (see, e.g. Tullock (1967, 1980), North (1990), Murphy *et al.* (1991), Drazen (2000), Mueller (2003), Hillman (2009), Acemoglu (2009), Esteban and Ray (2011) and Acemoglu and Robinson (2019), while for quantitative macroeconomic models see, e.g. Angelopoulos *et al.* (2009, 2011)). In practice, rent seeking involves acquiring influence and this can take various forms like lobbying, campaign contributions, political power, corruption, or a mix of them (see, e.g. Drazen (2000, ch. 3 and 8) and Stiglitz (2012)). In developed countries, a key role is played by lobbyists who secure extra benefits for rent seekers (see, e.g. Hasen (2012) and Igan and Lambert (2019)). Delegating rent seeking to agents who act as lobbyists (in the form of, e.g. hiring lobbying firms and agents that provide similar services, or having labour force working in-house in effect as lobbyists) can give rent seekers a better position.[5] These expert intermediaries (e.g. lobbyists) provide financial

[4] See, e.g. Drazen (2000, chapter 10). For the key importance of property rights among other measures of institutional quality, see, e.g. Hall and Jones (1999), Grossman (2001), Acemoglu (2009, chapters 4 and 22), Besley and Persson (2009), Besley and Ghatak (2010) and many others.

[5] Indeed, a strong intuitive relationship between rent seeking and lobbying has led economists often to treat the second as an indicator of the first. For example, Hillman (2009, ch. 2) points out that the presence of lobbyists is, in fact, an indication that rent seeking is taking place, while the literature has used the proportion of lawyers in a population as an indicator of rent-seeking activities (see, e.g. Murphy

and legal advice and mediate with relevant decision makers (e.g. policymakers, CEOs, managers and their advisers) to influence the decision process in favour of the group that they represent. The more complex a sector and its policies, the more room it offers for rent seeking and intermediation/lobbying.

We focus on rent seeking in the financial sector, which, due to its size (see, e.g. Philippon (2012, 2015)) and complexity of transactions involved, is believed to relate to particularly intense lobbying and rent seeking activities (see, e.g. Stiglitz (2012), Igan *et al.* (2012, 2017), Mazzucato (2018) and Igan and Lambert (2019)).[6] Evidence from, e.g. Igan *et al.* (2012, 2017) and Igan and Lambert (2019) links lobbying activities to such rent seeking, which can take many forms. For example, it may capture beneficial access to better credit conditions and directed loans or subsidies to specific industries or households; preferential access to investment in new or protected markets (including preferential treatment in failed-bank auctions), or in real estate, that imply higher returns; laxer treatment in the supervision of financial intermediaries, or less costly enforcement actions (e.g. lower penalties); and guaranteed bailouts (thus reducing the downside risk and allowing higher risk, higher return investment). Igan *et al.* (2012, 2017) and Igan and Lambert (2019) focus on the specific mechanisms linking rent seeking and lobbying in the banking/financial sector, and provide relevant empirical evidence suggesting that this lobbying is mainly related to rent seeking.

Our modelling below introduces rent seeking in the financial market to an incomplete markets general equilibrium model in a reduced form way. It does so by assuming, consistent with the literature, that financial rent seeking requires some form of intermediation and purposeful activity. Given that our modelling is at the macroeconomic level, we complement the existing empirical evidence on the positive relationship between rent seeking and intermediation activity, exemplified by lobbying, using aggregate level indicators for rent seeking and intermediation to acquire access to rent seeking.

We construct a panel country-level dataset (details can be found in Appendix A). To approximate institutional characteristics that determine the size of the rent seeking pie to be contested for, we use measures of institutional quality for a panel of countries constructed by Kuncic (2014). In particular, we use the Economic Institutions (EI) and the Political Institutions (PI) indices and define the variables $QI^e_{ct} = 1 - EI_{ct}$ and $QI^p_{ct} = 1 - PI_{ct}$, for country c and period t. Note that a higher value in QI^e_{ct} and QI^p_{ct} imply a worsening of institutions. To approximate the extent of intermediation activity for rent seeking at the macroeconomic scale, we use data on the proportion of the labour force employed in legal and financial occupations, for 26 countries in the EU, and the US, since, as discussed earlier, the literature typically links these two sectors to lobbying and rent seeking intermediation. We summarise the results from a fixed-effects regression, including a time trend, of rent seeking intermediation activity on the two different rent seeking proxies (namely, QI^e_{ct} and QI^p_{ct}), in the first three columns of Table 1.[7]

et al. (1991), Hillman (2009, p. 98))).

[6]Regarding the extent of lobbying from the financial sector, data analysed in Igan and Lambert (2019) shows that in the US lobbying expenses from the financial sector outspend other sectors. Whereas, in the EU, data in Wolf *et al.* (2014) reveal that there are more than seven times more lobbyists in this sector than in all other sectors together and more than five times lobbying organisations than in NGOs, trade unions and consumer organisations together.

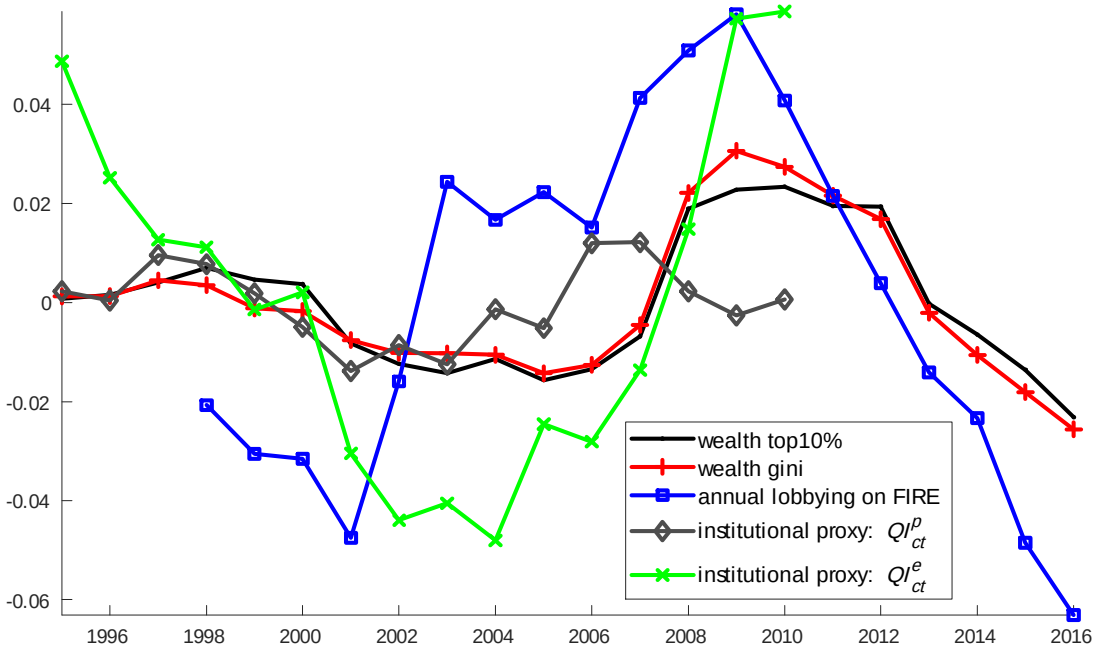
[7]The fixed-effects specification partials out variation between countries, exploiting variation over time, consistent with the absolute measures of economic and political institutional quality that we use. The time trend controls for general time patterns. Further details and robustness to the sample are discussed

Table 1: Rent seeking intermediation, wealth inequality and institutional quality

	(1)	(2)	(3)	(4)	(5)	(6)
QI^e_{ct}	0.007***		0.005**	0.225**		0.229**
(s.e.)	(0.002)		(0.002)	(0.092)		(0.092)
QI^p_{ct}		0.009***	0.008***		0.174	0.183
(s.e.)		(0.003)	(0.003)		(0.122)	(0.117)
adj. R^2	0.982	0.982	0.983	0.913	0.908	0.915
obs	432	432	432	76	76	76

Notes: Results from the regression $y_{ct} = a_c + bt + cQI^h_{ct} + \varepsilon_{ct}$, for the period 1995-2010, and for $h = e, p$, where y_{ct} (for country c and year t) refers to share of intermediation occupations in (1)-(3), and to the share of wealth owned by the top10% in (4)-(6); a higher QI^h_{ct} measures a worsening in institutional quality; and ***denotes that $p < 0.01$, and **that $p < 0.05$.
Data Source: Eurostat, CPS MORG (own calculations),WID and Kuncic (2014).

Figure 1: Quality of Institutions, lobbying and wealth inequality in the US



Notes: a higher QI^h_{ct} measures a worsening in institutional quality. All variables are detrended.
Data Source: CRP, WID and Kuncic (2014).

The results in Table 1 show a positive relationship between either QI^e_{ct} or QI^p_{ct} and the share of financial and legal employment. Therefore, they imply that a worsening (improvement) in institutional quality over time is associated with an increased (decreased) share of the labour force being employed in legal and financial occupations. Given our focus on the US, we complement the results in Table 1 with Figure 1, which plots, for the

in Appendix A.

US, the three variables, de-trended by a linear trend, as wells as an additional measure of lobbying in the financial sector, based on lobbying expenditure data from the Centre for Responsive Politics (see Appendix A and Igan and Lambert (2019) for more details). The results show that a worsening in institutional quality is associated with increased lobbying expenditure and increased employment in legal and financial occupations.[8]

2.2 (Financial) rent seeking and (wealth) inequality

It is generally recognised that rent-seeking competition favours elites, i.e. agents with higher socio-political power or status, as well as those with higher wealth (see, e.g. the literature reviewed in Karabarbounis (2011) and Acemoglu *et al.* (2015)).[9] Opportunities for rent seeking are more strongly concentrated to those with political power and/or with the right connections, who have an insider position in the economic system because they are well connected to important private and public decision-makers. The unequal distribution of socio-political power reflects long-standing processes with strong persistence; indeed, established elites are typically viewed as family lineages that persist through time. Moreover, success in rent seeking from the financial sector may increase with wealth because wealthier households have more opportunities to exploit situations that create higher financial returns. For example, wealthier households, being insiders in the financial market, may have better opportunities to benefit from more lucrative investment opportunities resulting from regulation (monopolies, investment subsidies, credit in better conditions), or weak property rights (e.g. relating to new technology and markets). More generally, wealthier households can have better opportunities for rent seeking by having access to more influential political and economic networks.

To the extent that the opportunity for rent seeking is concentrated on socioeconomic elites, rent seeking should be associated with higher inequality. Indeed, a line of research examines the relationship between socio-political elites and inequality since the Neolithic period, suggesting that extraction from elites is an important contributor to inequality (see, e.g. Halstead and O'Shea (1989), Halstead (2014), Boix (2015) and Scheidel (2017) for reviews and examples from pre-history to the early 20th century). The link between rent seeking and inequality has also been examined in static or two-period economic models (see, e.g. Dabla-Norris and Wade (2001), Chakraborty and Dabla-Norris (2006) and Chaturvedi (2017)).

This paper undertakes a quantitative analysis of the wealth and welfare distributional implications of rent seeking from the financial sector under idiosyncratic earnings. Data from the US and from other four countries for which a measure of wealth inequality (the concentration of wealth at the top 10% of the distribution) can be obtained for the same period as for the proxies for financial rent seeking (see columns (4)-(6) in Table 1), do suggest a positive relationship between rent seeking and wealth inequality (see Appendix A for more details). In particular, the results in Table 1 show a positive relationship between either QI^e_{ct} or QI^p_{ct} and the share of wealth owned by the top 10%, implying that a worsening (improvement) in institutional quality over time is associated with higher (lower) wealth inequality. The US data in Figure 1 also suggest a positive relationship

[8] The evolution of the variables' levels and pairwise correlations between the variables plotted in Figure 1 are also reported in Appendix A.

[9] Wealth, status and political power are intrinsically linked (see, e.g. Mokyr (1985) and Perkin (1969)) for a historical analysis and Cole *et al.* (1992) for an economic analysis).

between rent seeking and wealth inequality, when the latter is measured by either the wealth share of the top 10% or the Gini index.

Quantitative analysis requires a model where wealth inequality causes and is caused by rent seeking success in a stochastic dynamic framework. The stochastic environment can capture the role of earnings risk, a main driver of wealth inequality, while the intertemporal dimension can allow for endogenous wealth accumulation. A vast literature, based on seminal contributions by Bewley (1986), Huggett (1993) and Aiyagari (1994), has shown that idiosyncratic shocks to earnings under incomplete financial markets generate substantial wealth inequality, which is higher than earnings inequality.[10] In this class of models, a continuum of economic agents receives idiosyncratic earnings shocks against which they cannot fully insure. As a result, earnings shocks pass through to income, and hence differences in histories of idiosyncratic earnings create different opportunities for accumulating assets. In other words, earnings inequality is propagated, via incomplete financial markets, to wealth inequality. Therefore, the institutional framework regarding the financial market, and in particular financial market imperfections that lead to incomplete markets, is central to heterogeneous agent models. Here, we add a different form of financial market imperfection, related to rent seeking and arising from weak institutions, and investigate the distributional effects of its implications.

3 Heterogeneous agents and rent seeking

We build on a standard general equilibrium heterogeneous agent model (see, e.g. Aiyagari (1994)). The economy is in a stationary equilibrium where aggregate quantities are constant and is populated by a continuum of infinitely lived households distributed on the interval $I = [0, 1]$. Time is discrete and denoted by $t = 0, 1, 2, ...$ Households have identical preferences and derive utility from consuming a single good that firms produce. Labour supply is exogenous, but each household is subject to idiosyncratic labour productivity shocks. Financial markets are incomplete, and, in particular, households can save in a single asset so that they cannot fully insure themselves against idiosyncratic shocks to earnings.

We extend this setup to allow for rent seeking in the financial sector, where rent seeking requires services provided by specialised rent seeking firms. In particular, we assume an institutional failure in the form of ill-enforced property rights, implying that a fraction $0 \leq \theta < 1$ of accumulated savings of all households can be diverted away from productive uses to a group of rent-seeking households, and this takes place via the services provided by intermediation firms. In other words, the parameter $0 < 1 - \theta \leq 1$ quantifies the degree of property rights, and total savings play the role of the contestable prize. The economy also includes a producing sector, a financial sector that channels savings from households to firms, and an intermediation sector that rent seekers use to extract assets from the financial sector. Each of these three sectors is represented by respective competitive firms.

We will assume that households can belong to two different groups regarding their potential to extract resources from the common pool.[11] These two groups are denoted by

[10] For empirical evidence, reviews of this literature and extensions, see, e.g. Krueger *et al.* (2016), Quadrini and Rios-Rull (2015) and Kuhn and Rios-Rull (2016)).

[11] This assumption is related to Acemoglu and Robinson's (2012, 2019) notion of inclusive and exclusive

a superscript $h = e, o$ for rent seekers and non rent seekers, respectively. Households in the rent-seeking group (e) compete with each other for a share of the contestable prize, and the amount they extract depends on their relative wealth in a typical Tullock-type redistributive contest. On the other hand, non rent seekers (o) do not have access to the common pool. Therefore, in addition to differences in earnings due to idiosyncratic productivity shocks, households' incomes can differ because of rent seeking via the financial market, where the opportunity for rent seeking can be narrowly concentrated to the rent seeking group (e). Conditional on belonging to the rent seeking group, higher relative wealth allows a household to capture a bigger share of the pie that is available for rent seeking. In our baseline model, the classification of agents into rent seekers (e) and non rent seekers (o) will be exogenously set, reflecting the assumption that who belongs to the elite, or who is an insider, is a result of long standing socio-political processes and the right connections that are exogenous to purely economic factors. In subsequent analysis, this classification will become endogenously determined by relative wealth, an outcome that households can affect by their actions (see subsection 4.2). We also consider the case where all households appropriate resources via rent seeking. Motivated by Acemoglu and Robinson (2012, 2019), we term the situation in which everybody can participate in rent seeking as inclusive rent seeking, while the situation where some members are excluded as exclusive rent seeking.

3.1 Households

The labour productivity of a typical household i in class h at time t is denoted by $s_t^{i,h}$. At the beginning of period t, and before making any current decisions, the household observes its labour productivity shock and receives labour income $ws_t^{i,h}$, where w is the wage rate. We assume that the stochastic earnings process is the same for both household types, and that it evolves according to the m-state Markov chain with $m \times m$ transition matrix $Q_{ss'} = \Pr\left(s_{t+1}^{i,h} = s' | s_t^{i,h} = s\right)$, and state-space $S = [\overline{s}_1, \overline{s}_2, ..., \overline{s}_m]$, $\overline{s}_1 \geq 0$, $\overline{s}_{j+1} > \overline{s}_j$, $j = 1, ..., m-1$, with the σ-algebra $\mathcal{S}$ that is the power set of S. The transition matrix $Q_{ss'}$ provides the conditional probability that the household will be in state s' in period $t+1$, given that it is in state s in period t. Denoting by π_{ij} the elements of $Q_{ss'}$, we assume that there exists n_0 such that $(\pi_{ij})^n > 0$, $\forall\,(i,j)$, for all $n > n_0$, where $n \in \mathbb{N}_+$, and that $\pi_{11} > 0$. These assumptions guarantee that there exists a unique invariant distribution (see, e.g. Acikgoz (2018)). We denote the unique invariant distribution by ξ.

All households receive the common and guaranteed return r on their savings and the same wage rate w. Furthermore, as said above, there are additional returns via rent seeking, which depend on whether the household belongs to the $h = e$ group and the household's relative wealth. We denote the population fraction of rent seekers by $0 \leq n^e \leq 1$, so that, by setting it at different values between 0 and 1, we can examine the implications of exclusive versus inclusive rent seeking.[12] We assume that the institutional framework allows for a fraction $0 \leq \theta < 1$ of total assets, A, to be redistributed, via rent seeking competition. The amount of this pie that a typical household can extract is

economic institutions. The former provides opportunities to a broad cross-section of society, while, in the latter, opportunities are narrowly concentrated on elites. In our case, we extend this concept to an exclusive socio-political system restricting entry to rent seeking competition.

[12] As said, in subsection 4.2 below, we examine the implications of defining elites that appropriate the rent seeking gains in terms of relative wealth.

determined by the function $d_t^{i,h} \equiv 1_e \frac{a_t^{i,e}}{A^e}$, where $1_e = 1$ when $h = e$ and $1_e = 0$ otherwise, and A^e denotes aggregate savings of the rent seeking class. Thus, conditional on being a rent seeker, the extraction technology is given by $d_t^{i,e} \equiv \frac{a_t^{i,e}}{A^e}$, implying that the amount of resources extracted depends on own wealth relative to average wealth of the competitors, capturing the idea that wealthier rent seekers can extract more resources.[13] However, households - rent seekers do not appropriate the whole amount they extract from the pie. This happens because they need to incur expenses to participate in the rent seeking competition, modelled as payments to rent seeking firms, which will be discussed later (e.g. fees for lobbying, financial and legal advice). Such expenses are determined by the amount of resources they extract and a price $p_\ell \in [0, 1]$.

Households use their income for consumption $c_t^{i,h} \geq 0$ and next-period wealth $a_{t+1}^{i,h}$. Define the set including the permissible values for $a_t^{i,h}$ as $\mathcal{A} = [0, +\infty)$. Market prices, w, r and p_ℓ, as well as aggregate quantities, A^h and A, are taken as given by the household and are determined in equilibrium. Given the sources of income analysed above, household i in group $h = e, o$ faces the budget constraint:

$$c_t^{i,h} + a_{t+1}^{i,h} = (1 + r)\, a_t^{i,h} + w s_t^{i,h} + d_t^{i,h} \theta A - p_\ell d_t^{i,h} \theta A. \tag{1}$$

Define the net interest rate, $\widetilde{r}^h$, as

$$\widetilde{r}^h = r + 1_e\, (1 - p_\ell)\, \frac{\theta A}{A^e}, \tag{2}$$

so that (1) can be written as:

$$c_t^{i,h} + a_{t+1}^{i,h} = \left(1 + \widetilde{r}^h\right) a_t^{i,h} + w s_t^{i,h}. \tag{3}$$

Some points are worth making regarding the household's budget constraint. First, we do not model the rent-seeking households as choosing which proportion of their assets to use to achieve higher returns from rent seeking; instead, we let them use all their assets for this purpose. As long as $p_\ell \leq 1$, a rent-seeking household would find it beneficial to participate in rent seeking with all its assets in this setup if given such a choice. Second, in this specification, returns to saving ($\widetilde{r}^h$) at the household level remain independent of the household's own wealth and are common across households of the same rent seeking class.[14] Although (1) - (3) does not introduce idiosyncratic heterogeneity in returns to wealth or increasing returns to savings (see, e.g. Fagereng *et al.* (2016), Benhabib *et al.* (2017) and Benhabib and Bisin (2018) on the importance of these factors), there is a non-stochastic, *ex ante* variation in the returns to wealth between the two groups. Finally, p_ℓ is determined in equilibrium, and its main role is to capture household-level costs of rent seeking that atomistic households take as given (see also Besley and Ghatak (2010) for different ways to model the resource misallocation costs resulting from weak institutions).

Households have the inter-temporal discount factor $\beta \in (0, 1)$ and use a per period utility function $u(c) : [0, +\infty) \to \mathbb{R}$, which is bounded, twice continuously differentiable,

[13] This (i.e. $\frac{a_t^{i,e}}{A^e}$) is consistent with Tullock's (1980) probabilistic contest-success function (see also, among many others, Murphy *et al.* (1991), Dixit (2004, chapter 5) and Esteban and Ray (2011)).

[14] Note that the amount of resources extracted via rent seeking is a positive function of own wealth. However, because the amount of resources extracted is assumed to be proportional to own wealth, the rate of return, $\widetilde{r}$, is independent of own wealth. We return to these points in Section 4.

strictly increasing and strictly concave. Furthermore, it satisfies the conditions $\lim_{c\to 0} u_c(c) = +\infty$, $\lim_{c\to\infty} u_c(c) = 0$ and $\lim_{c\to\infty} \inf -\frac{u_{cc}(c)}{u_c(c)} = 0$. These assumptions are common in the literature relating to incomplete markets with heterogeneous agents in general equilibrium (see, e.g. Aiyagari (1994) and Acikgoz (2018)). The interest rate and wage rate are taken as given and satisfy $\widetilde{r}^h > -1$ and $w > 0$. Moreover, as has been shown (see, e.g. Aiyagari (1994), Miao (2014, ch. 8) and Acikgoz (2018)), a necessary condition for an equilibrium with finite assets at the household level in this class of models is that $\beta\left(1+\widetilde{r}^h\right) < 1$.

We summarise the optimisation problems for the typical households by suppressing the superscript i so as to simplify notation. Given values of $(w, \widetilde{r}^h)$, and given initial values $(a_0^h, s_0^h) \in \mathcal{A}\times S$, the typical households for $h = e, o$ choose plans $\left(c_t^h\right)_{t=0}^{\infty}$ and $\left(a_{t+1}^h\right)_{t=0}^{\infty}$ that solve the problem:

$$V^h(a_0^h, s_0^h) = \sup_{\left(c_t^h, a_{t+1}^h\right)_{t=0}^{\infty}} E_0 \sum_{t=0}^{\infty} \beta^t u(c_t^h), \tag{4}$$

where $a_t^h \in \mathcal{A}$, $c_t^h \geq 0$ is given by (3), and $u(\cdot)$ and s_t^h satisfy the assumptions imposed earlier. To obtain the dynamic programming formulation of the household's problem, let $v^h\left(a_t^h, s_t^h; w, \widetilde{r}^h\right)$ denote the optimal value of the objective function starting from asset-productivity state $\left(a_t^h, s_t^h\right)$. Suppressing dependence on aggregate quantities, the Bellman equation is:

$$\begin{aligned} & v^h\left(a_t^h, s_t^h\right) = \\ & = \max_{a_{t+1}^h \geq 0, c_t^h \geq 0} \{u(c_t^h) + \beta \textstyle\sum_{s_{t+1}^h \in S} v\left(a_{t+1}^h, s_{t+1}^h\right) Q_{s_t, s_{t+1}}\}. \end{aligned} \tag{5}$$

Standard dynamic programming results imply that the policy functions $a_{t+1}^h = g^h\left(a_t^h, s_t^h\right)$ and $c_t^h = q\left(a_t^h, s_t^h\right)$, which generate the optimal sequences $\left(a_{t+1}^{h*}\right)_{t=0}^{\infty}$ and $\left(c_t^{h*}\right)_{t=0}^{\infty}$ that solve (4), exist, are unique and continuous.

3.2 Financial sector

A single firm represents the financial sector. It borrows all available assets from households, A, at the rate r, but it lends only a proportion of these assets to the producing firms at the competitive interest rate r^f. In particular, it can only lend $(1-\theta)A$ assets to the producing firms because the rest, θA, are diverted to other rent-seeking uses. This specification can capture, for example, intervention in the financial market (e.g. directed loans or subsidies to specific industries or households) or bonuses, payments and other expenses paid out to managers, shareholders or other individuals. The firm makes zero profits, requiring that:

$$\begin{aligned} (1+r)A &= \left(1+r^f\right)(1-\theta)A, \text{ or} \\ r &= \left(1+r^f\right)(1-\theta) - 1 \end{aligned} \tag{6}$$

3.3 Production sector

A single producing firm borrows assets from the financial sector at a constant rental rate r^f. Moreover, it operates an aggregate, constant returns to scale production function using

as inputs the average (per capita) levels of capital K^f and employment L^f. The production function is given by $F(K^f, L^f)$ and is assumed to satisfy the usual Inada conditions. In particular, F is continuously differentiable in the interior of its domain, strictly increasing, strictly concave and satisfies: $F(0, L^f) = 0$, $F_{KL} > 0$, $\lim_{K\to 0} F_K(K^f, L^f) \to +\infty$ and $\lim_{K\to\infty} F_K(K^f, L^f) \to 0$. The capital stock depreciates at a constant rate $\delta \in (0, 1)$. The firm takes the rental rate, r^f, and wage rate, w, as given and chooses capital and employment to maximise profits. Optimisation gives the standard first-order conditions, where factor input prices are equal to the relevant marginal products:

$$w = \partial F(K^f, L^f)/\partial L^f, \tag{7}$$

$$r^f = \partial F(K^f, L^f)/\partial K^f - \delta. \tag{8}$$

3.4 Rent seeking intermediation sector

A single rent seeking intermediation firm uses labour input L^ℓ (for legal and financial advice and other lobbying services), which is paid the competitive wage w, to produce rent seeking (i.e. the quantity of assets extracted from the financial sector) using the linear production function $G\left(L^\ell\right) = ZL^\ell$, where Z is productivity parameter. The production of rent seeking must equal household demand, hence:

$$\theta A = ZL^\ell. \tag{9}$$

The output θA is sold to rent-seeking households at the price p_ℓ, determining profits, $\eta^\ell = p_\ell ZL^\ell - wL^\ell$. The zero-profit condition requires that:

$$p_\ell = \frac{w}{Z}. \tag{10}$$

Note that, given the inelastic demand for rent seeking services from the household problem, the amount of labour used in rent seeking, L^ℓ, is determined in equilibrium by (9). In turn, (10) determines the equilibrium price of rent seeking services.

3.5 Equilibrium and calibration

The aggregate quantities satisfy

$$\begin{aligned} &K^f = (1-\theta)\, A \\ &L^f + L^\ell = \textstyle\sum_{j\in S} \overline{s}_j \xi\left(\overline{s}_j\right) \equiv 1 \\ &A = A^e + A^o. \end{aligned} \tag{11}$$

In Appendix B we define the stationary general equilibrium and summarise the computational algorithm to solve for the stationary equilibrium. We calibrate the model using commonly used parameter values or information from US data at an annual frequency. The majority of parameters in the model are the same as in standard versions of the Aiyagari (1994) model which have been calibrated to US data in the literature (note that for $\theta = 0$ the model collapses to the standard Aiyagari (1994) model). Hence, we follow the existing research regarding the choice of these parameters.

We start with the earnings process for s_t. We assume that labour income follows

an AR(1) process and, by following Kitao (2008), we set the autocorrelation coefficient equal to $\rho = 0.94$ and conditional variance equal to $\sigma^2 = 0.02$. These parameter values are informed by econometric estimation based on data from the Panel Study of Income Dynamics (PSID) (e.g. Storesletten *et al.* (2004) and Hubbard *et al.* (1994)). We then approximate this AR(1) process with a 9-state Markov chain using the method in Rouwenhorst (1995). This method determines an equally spaced state-space S, normalised to have a unit mean, and the 9×9 transition matrix $Q_{ss'}$.

The functional forms for household preferences and production technology follow standard calibrations for the US since Aiyagari (1994). In particular, we use a CRRA utility function:

$$u(c) = \frac{c^{1-\sigma}}{1-\sigma}, \tag{12}$$

and set $\sigma = 2$ (Kitao (2008)). Moreover, we set the annual depreciation rate to be $\delta = 0.10$ (Krueger *et al.* (2016)) and we use a Cobb-Douglas production function with constant returns to scale with respect to its inputs:

$$Y = T\left(K^f\right)^{\alpha}\left(L^f\right)^{1-\alpha}.$$

where we normalise $T = 1$ and set α to 0.33 (Heathcote *et al.* (2010)).

For the benchmark results, we set n^e, the population share of the socio-political elite, to be 10%, which is the share of elementary and secondary school-aged American children enrolled in private schools (for the link between education and persistence of elites see e.g. Khan (2012), Bukodi and Goldthorpe (2018), and Milanovic (2020)).[15] In Section 4, we also examine the implications of extending the rent seeking franchise to everyone by setting $n^e = 1$ and eliminating the elite's potential for rent seeking by setting $\theta = 0$. We also examine the implications of letting the group of rent seekers be defined according to their wealth, in particular those households at the top 10% of the wealth distribution. The latter is motivated by empirical evidence, which suggests that 10% of the population holds more than 90% of the financial assets in the US (see Kuhn *et al.* (2020)). In other words, we assume that it is the wealthier 10% that have high enough assets to use them to extract financial resources meaningfully. Therefore, the two alternative ways of calibrating the proportion of rent seekers, i.e. when they are defined endogenously in terms of wealth and when they are defined with respect to conditions reflecting social circumstances outside of the model, imply that the same proportion of the population extracts benefits from rent seeking.

We calibrate β so that the economy attains a ratio of $\frac{K^f}{Y} = 2.65$ (see, e.g. Kitao (2008)). We calibrate the parameter Z, in conjunction with the key parameter measuring the strength of the quality of institutions, θ. For the base results, we calibrate θ and Z so that: (i) 0.9% of the labour force work in the rent seeking intermediation sector, which is one quarter of the labour force in "Legal", "Real Estate" and "Financial" occupations, using data from Bureau of Labour Statistics, Labor Force Statistics, from the Current Population Survey (see Section 2 for details); and (ii) the spread $r^f - r$ is 0.0046 which is consistent with the one quarter of the average financial intermediation costs in Philippon (2015), which capture the extent of financial frictions (see also Hall (2013), noting that, in our model, rent seeking is a form of financial friction (see also e.g. Khwaja and Mian

[15] This share is obtained by NCES (2019) and has been stationary in recent decades, between 11% in 1999 and 10% in 2017.

(2011)). We discuss sensitivity to these targets in section 4.1 and summarise the parameters for the base model in Table 2. The parameters β, Z and θ will be re-calibrated in the model variants we consider in Section 4 to ensure these targets are met.

Table 2: Model Parameters

σ	n^e	δ	T	α	ρ	σ^2	β	Z	θ
2.0	0.1	0.10	1	0.33	0.94	0.02	0.9630	2.224	0.0046

3.6 Wealth accumulation under rent seeking

Before presenting quantitative results, we study in more detail the main mechanism by which rent seeking affects household decisions to accumulate wealth by altering the returns to saving $\widetilde{r}^h$ differently for the two groups $h = e, o$. Examining this mechanism allows us to provide a preview of model predictions on the direction of effects of rent seeking on wealth accumulation and inequality in the stationary equilibrium, and support the interpretation of the quantitative results in the next Section. Several observations can be made.

First, for given $\theta > 0$, a typical rent seeker has higher mean wealth than a typical non rent seeker, so that the group of rent seekers has higher wealth, on average, compared with the group of non rent seekers. In particular, comparing the net return $\widetilde{r}^h$ for the two groups $h = e, o$ in (2), we see that, for any r, a typical rent seeker faces a higher return to savings compared to a typical non rent seeker, implying that in the stationary equilibrium a typical rent seeker should have higher mean wealth. Indeed, in Appendix B, we plot the policy functions for rent seekers and non rent seekers for the calibration in Section 3.5 and see that next period wealth, which is non-decreasing in both assets and earnings, is higher for rent seekers relative to non rent seekers.[16] Given that the mean wealth of a typical household in each group $h = e, o$ is, in the stationary equilibrium, also the average wealth across the households in each of these groups (see, e.g. Aiyagari (1994), Miao (2014), Acikgoz (2018)) and Appendix B), the group of rent seekers should have, on average, higher wealth accumulation than the group of non rent seekers, leading to between-group inequality. The quantitative analysis below confirms this model prediction.

Second, for given $\theta > 0$, the variation in wealth within the group of rent seekers, $h = e$, should be smaller relative to that within the group of non rent seekers, $h = o$, in the stationary equilibrium. This difference occurs because the additional incentives to save under $\theta > 0$ for rent seekers relative to non rent seekers, which imply that $\widetilde{r}^o < \widetilde{r}^e$, also imply that rent seekers' asset accumulation choices depend less on stochastic earnings, which vary across households, and more on factors that are common across households, i.e. $\widetilde{r}^e$. This is manifested by a higher proportional increase in savings for rent seekers with lower earnings (or with lower wealth) than those with higher earnings (or with higher wealth). We examine both effects in turn since together they imply smaller variation in wealth in the stationary equilibrium for the group of rent seekers, relative to the group of non rent seekers, which is confirmed in our quantitative results in the next Section.

We start with convergence in wealth accumulation for different levels of earnings due to higher $\widetilde{r}^e$. By inspecting the budget constraint in (3), we see that an increase in $\widetilde{r}^e$ re-

[16] The literature has shown that, in the standard income fluctuation problem, both household consumption and wealth accumulation functions are non decreasing in available resources (see, e.g. Aiyagari (1994), Miao (2014), and Jappelli and Pistaferri (2017)).

duces, other things equal, the relative difference in available resources between households with high and low earnings.[17] Because next period wealth is an increasing function of available resources (see, e.g. Aiyagari (1994), Miao (2014) and Appendix B), convergence in relative available resources tends to reduce, other things equal, relative next period wealth for households with high and low earnings. This effect can be seen in subplot (1,1) of Figure 2, where we show that the proportional increase in next period wealth for rent seekers relative to non rent seekers is higher (on average across states of wealth for each earnings level) for rent seekers with lower levels of earnings, compared with rent seekers with higher levels of earnings.[18] Given that in the stationary equilibrium households find themselves, over time, in different earnings states resulting from stochasticity in earnings, convergence in wealth accumulation across the different earnings states implies lower wealth inequality. Intuitively, within-group variation in wealth in the long run (the stationary equilibrium) results from variation in the history of earnings, given precautionary incentives to mitigate against idiosyncratic shocks to earnings. Hence, factors that reduce the effect of earnings variation on wealth variation tend to reduce wealth inequality. The additional income opportunity from rent seeking plays such a role[19] and tends to reduce within-group inequality for rent seekers relative to non rent seekers.

We then examine a reduction in differences in next period wealth for different levels of assets. In subplot (2,1) of Figure 2, we show the proportional change in the choice of next period wealth for rent seekers relative to non rent seekers, for various levels of assets and earnings. The changes are positive and more pronounced for rent seekers with lower current wealth[20], for any level of earnings, which tends to reduce within-group inequality for rent seekers relative to non rent seekers.[21] The relatively lower proportional change in savings for households with higher wealth reflects assumptions on the concavity of the utility function and diminishing returns to savings that imply an upper bound on wealth. The assumptions imposed on the utility function guarantee that there is an upper bound on wealth (see, e.g. Aiyagari (1994), Miao (2014) and Acikgoz (2018)), and imply that for a sufficiently high level of wealth (or available resources) households are insured against idiosyncratic risk so that they stop accumulating wealth for precautionary motives. More generally, the precautionary savings incentives are stronger for lower levels of wealth or available resources (see, e.g. Bertola *et al.* (2014), Ch. 9, and Jappelli and Pistaferri (2017), Ch. 7). Under idiosyncratic earnings, an increased stock of assets has the added value that it protects households from possible drops of consumption in the future due to shocks to earnings. This added value is lower for households with higher wealth because their existing wealth provides enough insurance. On the other hand, for households with

[17] Consider e.g. two levels of producitivity, $s_t^2 > s_t^1$. Then, the relative available resources for two households with assets a_t is given by $\left[(1+\widetilde{r}^e)\, a_t + w s_t^2\right] / \left[(1+\widetilde{r}^e)\, a_t + w s_t^1\right]$, which is decreasing in $\widetilde{r}^e$.

[18] The plots in Figure 2 are constructed for the model with the parameters described in Section 3.5.

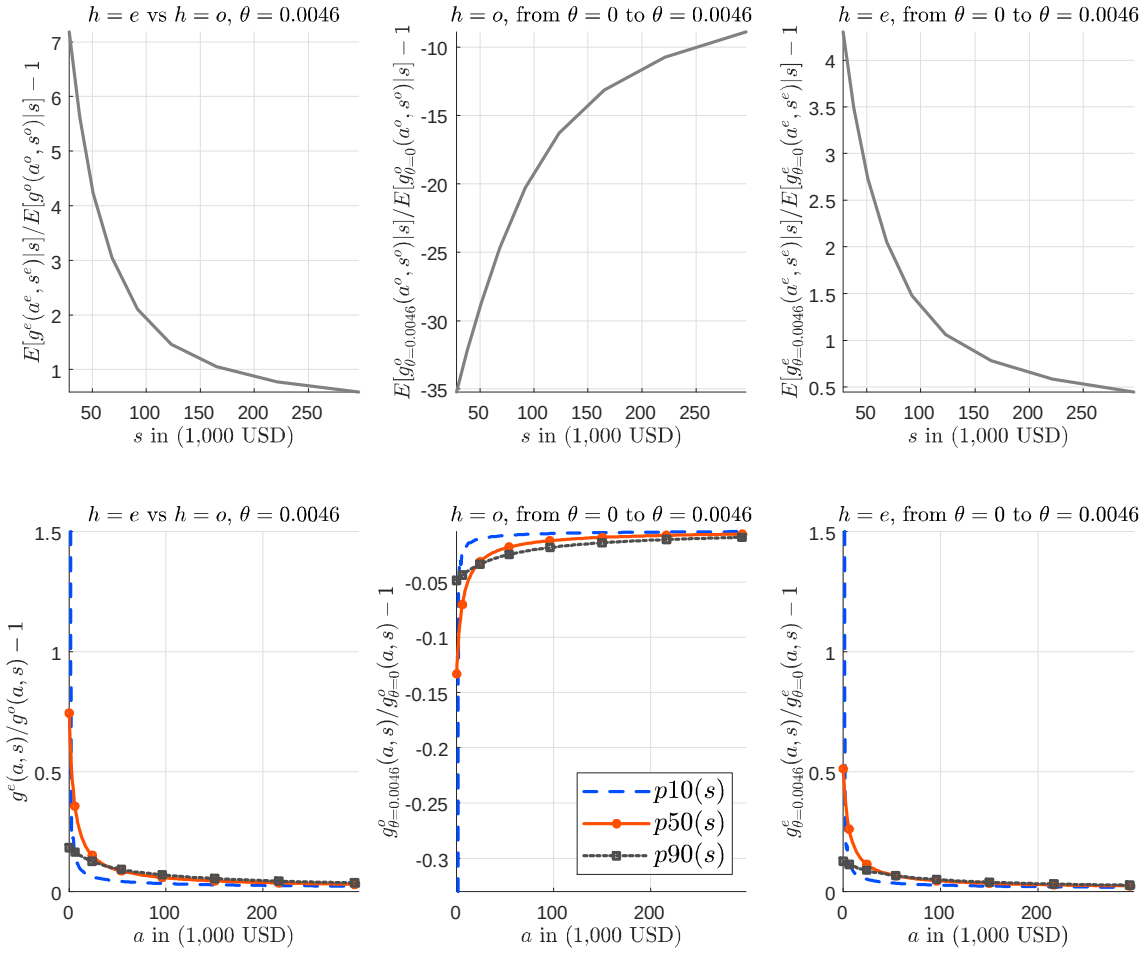
[19] Other such factors that affect the incentive to save have been examined in the literature. For example, see Aiyagari (1993) for the role of increased risk aversion, which increases savings and reduces wealth inequality for the same level of earnings variation. Another example that works in the opposite direction is a tax on asset income in Kitao (2008).

[20] We plot proportional changes in next period wealth for a subset of possible outcomes of earnings and assets to illustrate the effects. The monotonicity of the curves shown is maintained for higher levels of assets and different earnings levels.

[21] Note that it is the *relative* (or proportional) change that is bigger for lower earnings (subplot (1,1) and lower asset levels (subplot (1,2), not the *absolute* change, which is bigger for higher levels of earnings/wealth (see Appendix B). It is the reduction in the relative gap of wealth that implies the reduction in wealth inequality.

lower wealth and consequently with increased exposure to earnings risk, the incentives to increase savings following an increase in the return to savings are relatively stronger. Therefore, by providing an additional channel to insure against possible future drops in earnings for rent seekers with lower wealth, the additional returns from rent seeking work to close the gap in relative wealth among rent seekers.

Figure 2: Changes in the next period assets



Note: The scale of the x-axis is obtained by transforming assets in USD, by multiplying by real mean family income in 2015 expressed in 2019 prices as measured by CPI-U-RS.

Third, in the stationary general equilibrium, and comparing an economy with $\theta > 0$ to one where $\theta = 0$, we should expect non rent seekers' mean wealth and within-group inequality to decrease and increase, respectively. This is because rent seeking tends to reduce the return r and w (see (6)-(7)) by diverting assets from productive uses to rent seekers. The reduction in r affects asset accumulation of the $h = o$ households in a similar, but opposite in terms of direction, way to how the increase in the return to savings due to rent seeking affected asset accumulation of $h = e$ households relative to $h = o$ households, as analysed above (second model prediction). This effect can be seen in the second column of subplots in Figure 2, which plot the proportional change in next period wealth for the group of non rent seekers by moving to $\theta = 0.0046$ from $\theta = 0$, for different levels of

earnings (subplot (1,2)) and assets (subplot (2,2)). The changes are negative, implying that wealth is reduced for non rent seekers following the reduction in the return to savings due to rent seeking (see also the discussion regarding the first observation). Moreover, the proportional drop in next period wealth is greater for households with lower earnings or lower assets, i.e. households with lower available resources and lower consumption. These households are more sensitive to drops in consumption, given the concavity of the utility function. Hence they need to mitigate drops in consumption from the loss of asset income, implying that they have to let their savings drop proportionately more. Similarly, the reduction in w reduces available resources, and in turn, this reduces wealth accumulation proportionately more for households with lower available resources. Our quantitative analysis confirms the increase in wealth inequality for non rent seekers when θ increases.

While an increase in θ unambiguously increases within-group inequality for non rent seekers, because it reduces $\widetilde{r}^o = r$, as explained under the third model prediction above, the effects of an increase in θ on within-group inequality for the group of rent seekers in general equilibrium depend on the magnitude of the reduction in r, relative to the increase in returns due to rent seeking. In particular, compared with non rent seekers, there is an additional mechanism that tends to reduce within-group inequality for rent seekers: their return to savings, $\widetilde{r}^e = r + (1 - p_\ell)\,\frac{\theta A}{A^e}$, includes the return from rent seeking, $(1 - p_\ell)\,\frac{\theta A}{A^e}$, in addition to the interest rate r. The "rent seeking" part works, as described under the second model prediction above, to reduce within-group wealth inequality, whereas the interest rate part works, as described under the third model prediction, to increase wealth inequality. We investigate these effects quantitatively in the next Section.

Finally, changes in overall wealth inequality depend on the magnitudes of the increase in between-group inequality and in within-group inequality for non rent seekers, versus changes in within-group inequality for rent seekers. The quantitative evaluation of the relevant trade-off is also examined in the next Section. However, we note that the discussion here makes clear that in a model economy where the general equilibrium effect on factor prices is switched off, then within-group inequality for rent seekers would unambiguously decrease, while within-group inequality for non rent seekers would remain unchanged.[22] However, overall wealth inequality could still increase because of the increase in between-group inequality.

4 Distributional implications

We employ a counterfactual analysis to demonstrate that financial rent seeking increases wealth inequality and implies welfare gains to those who have the possibility to extract resources from aggregate financial assets. We also examine the role of heterogeneity in the ability to increase one's income via rent seeking from the financial sector. We conclude with an evaluation of a tax on the rent seeking intermediation sector.

[22] Examples of modelling assumptions that can deliver such an outcome include e.g. a situation where the interest rate is determined in an international market irrespective of local conditions and the wage rate is determined by non-market factors; or, where rent extraction does not reduce the economy's assets, but instead the rent seeking pie is made up of international assets.

4.1 Wealth and welfare inequality under rent seeking

In Table 3, we summarise the model's key predictions regarding the wealth distribution and key aggregate quantities for two different stationary equilibria, one corresponding to the base calibration and the other representing a counterfactual economy without financial rent seeking. The latter is obtained as a comparative static exercise by setting $\theta = 0$ in the base model and keeping the remaining parameters unchanged. We treat θ as the exogenous factor determining institutional quality, which determines the size of the pie available for rent seeking, and consider as a proxy for rent seeking activity the proportion of the labour force working in the rent seeking intermediation sector ($L^\ell = 1 - L^f$). This measure increases with θ in Table 3, implying a positive relationship consistent with the empirical evidence in Section 2.

An important result from Table 3 is that wealth inequality is higher under financial rent seeking, which is also consistent with the patterns in the data in Section 2. In particular, a value of $\theta = 0.0046$ compared with $\theta = 0$, implies increases in the Gini index of wealth inequality, while the proportion of wealth owned by the upper two quintiles of the wealth distribution increases.[23] Rent seeking also has unequal welfare implications. In particular, it reduces the welfare of a typical non rent seeking household populating the economy in a stationary equilibrium, while welfare for a typical rent seeking household is increased.[24] Overall, there is a reduction in aggregate welfare.

Table 3: The effects of financial rent seeking in the stationary equilibrium.

θ	0.46%	0%		0.46%	0%
Gini	0.623	0.598	K^f	4.245	4.411
Top 40%	0.862	0.845	L^f	0.991	1
Top 10%	0.415	0.385	p_ℓ	0.487	-
Top 1%	0.078	0.066	r	0.020	0.022
wealth share of RS	0.232	-	$\widetilde{r}^e$	0.030	0.022
Gini $h = e$	0.510	0.598	r^f	0.025	0.022
Gini $h = o$	0.617	0.598	w	1.083	1.093
$\frac{E[g^e(a^e,s^e)]}{E[g^o(a^o,s^o)]}$	2.717	1	Welfare	-0.975	-0.960
$E[g^e(a^e, s^e)]$	9.888	4.411	Welfare $h = e$	-0.835	-0.960
$E[g^o(a^o, s^o)]$	3.640	4.411	Welfare $h = o$	-0.990	-0.960

Consistent with the model predictions analysed in Section 3.6, under $\theta = 0.0046$, there is between-group wealth inequality, lower within-group wealth inequality for rent seekers than non rent seekers, and an increase in within-group wealth inequality for non

[23] Moreover, the concentration of wealth at the upper 10% and 1% of the distribution increases. Overall, the wealth inequality predictions of the model are broadly similar to those of similar models with idiosyncratic earnings shocks (see, e.g. Kitao (2008)). The benchmark Aiyagari (1994) model underpredicts inequality quantitatively, especially at the top end of the wealth distribution. The literature has considered many extensions that improve the predictions of the model, often focusing on improving wealth inequality predictions at the top percentiles (see, e.g. the reviews in Krueger *et al.* (2016), Benhabib *et al.* (2017) and Benhabib and Bisin (2018)).

[24] Welfare per class is calculated as the expected utility of a typical household in each class in the stationary equilibrium, using (12). Welfare for the whole economy is calculated as the weighted average of these two values under $\theta = 0.0046$ (using the respective population weights), and as the expected utility of a typical household populating the $\theta = 0$ economy.

rent seekers compared with $\theta = 0$. Regarding between-group inequality, in Table 3, we report the mean wealth for both groups for the two economies and note that these diverge under financial rent seeking, both because rent seekers have higher mean wealth compared with the $\theta = 0$ economy, and because the mean wealth has fallen for non-rent seekers. Regarding within-group inequality, we report the Gini indices for the two groups and note that the Gini is higher for non rent seekers when they are in the $\theta = 0.0046$ economy than that of $\theta = 0$. On the contrary, within-group inequality is reduced for the rent seeking class when $\theta = 0.0046$, compared with the $\theta = 0$ economy. Overall, inequality has increased under $\theta = 0.0046$. We examine in the next subsection in more detail the last two results, namely the reduction in inequality within the group of rent seekers and the increase in overall inequality, as they are determined by the quantitative evaluation of different effects both at group and aggregate levels.

Table 4 presents results for higher and lower targets for the calibration of θ and Z, implying weaker or stronger underlying institutions and a higher or lower rent seeking intermediation sector. The qualitative results regarding wealth and welfare inequality remain unchanged. Naturally, the effects are stronger, the higher the misallocation of capital and labour, but even with the lower misallocation targets, implying 0.37% of assets extracted due to rent seeking, and 0.7% of the labour effort at the economy level related to rent seeking activities, the effects remain sizeable.

Table 4: Robustness

Targets	$r^f - r = \frac{1.87\%}{3}, L^\ell = \frac{3.5\%}{3}$		$r^f - r = \frac{1.87\%}{5}, L^\ell = \frac{3.5\%}{5}$	
θ	0%	0.61%	0%	0.37%
Gini	0.597	0.634	0.598	0.617
K^f	4.458	4.233	4.383	4.253
Gini $h = e$	0.597	0.495	0.598	0.520
Gini $h = o$	0.597	0.622	0.598	0.614
$\frac{E[g^e(a^e,s^e)]}{E[g^o(a^o,s^o)]}$	1	3.276	1	2.384
Welfare $h = e$	-0.958	-0.809	-0.961	-0.853
Welfare $h = o$	-0.958	-0.997	-0.961	-0.986

See Section 3 for details for the data targets. For the base results in Table 3 the targets are $r^f - r = \frac{1.87\%}{4}$, $L^\ell = \frac{3.5\%}{4}$. For θ=0.61%, Z is 2.2208, and for θ=0.37%, Z is 2.2259.

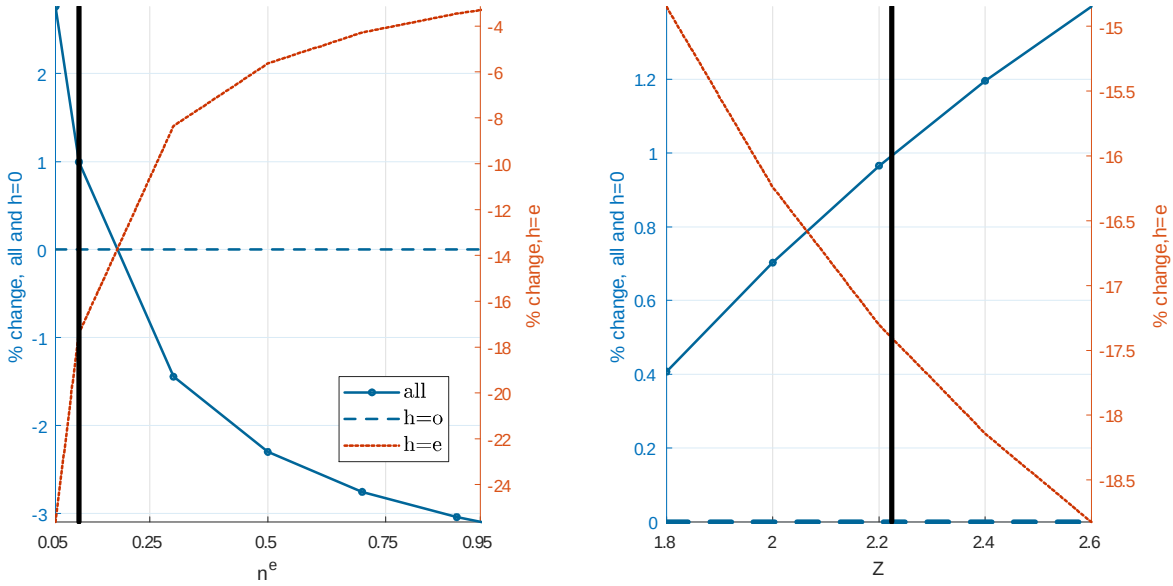
4.1.1 Group specific versus general equilibrium effects

We examine factors that determine the strength of the group specific and general equilibrium effects of rent seeking and the magnitude of the change in wealth inequality. We define as group-specific effects those that work for given r and w because such effects matter only for rent seekers. The general equilibrium resource misallocation that works via r and w affects decision making for all households. The return to savings for rent seekers (see (2)) is affected by the group-specific increase that is due to rent seeking, $(1 - p_\ell)\frac{\theta A}{A^e}$, and by the decrease in r, which is due to the general equilibrium resource misallocation.

We start with factors that work predominantly via group-specific effects. Group-specific effects are mainly influenced by how exclusive the group of rent seeking is (i.e. how small n^e is), and how effective or productive the rent seeking intermediation sector is (i.e. how high Z is). A more exclusive rent seeking, implying that the extracted resources

are shared within a smaller group (i.e. the ratio $\theta A/A^e$ tends to be bigger), incorporates forces that tend to increase returns $\widetilde{r}^e$ more, and thus tends to increase savings for a typical rent seeker and decrease within group inequality for the rent seeking sector (see discussion of second observation in Section 3.6). A more effective rent seeking intermediation sector (a higher Z) implies a lower price for rent seeking, p_ℓ (see (10)). This implies that intermediation costs are lower for rent seekers, which also tends to increase $\widetilde{r}^e$ and thus increase savings for a typical rent seeker and reduce wealth inequality within the group of rent seekers. Taken together, these effects suggest that more exclusive and less costly rent seeking should tend to reduce within-group inequality for rent seekers by more. In Figure 3, we plot the proportional increase in the Gini index for rent seekers from $\theta = 0$ to $\theta = 0.0046$, against these two parameters (subplots (1,1) and (1,2)), for fixed r and w, in a standard comparative static exercise, and confirm these effects. As can also be seen in Figure 3, for fixed r and w, there is no effect in within-group inequality for the group of non rent seekers, but overall inequality increases, despite the drop in within-group inequality for rent seekers, because of the increase in between-group inequality.

Figure 3: Change in wealth Gini from $\theta = 0$ to $\theta = 0.46\%$ for fixed r and w

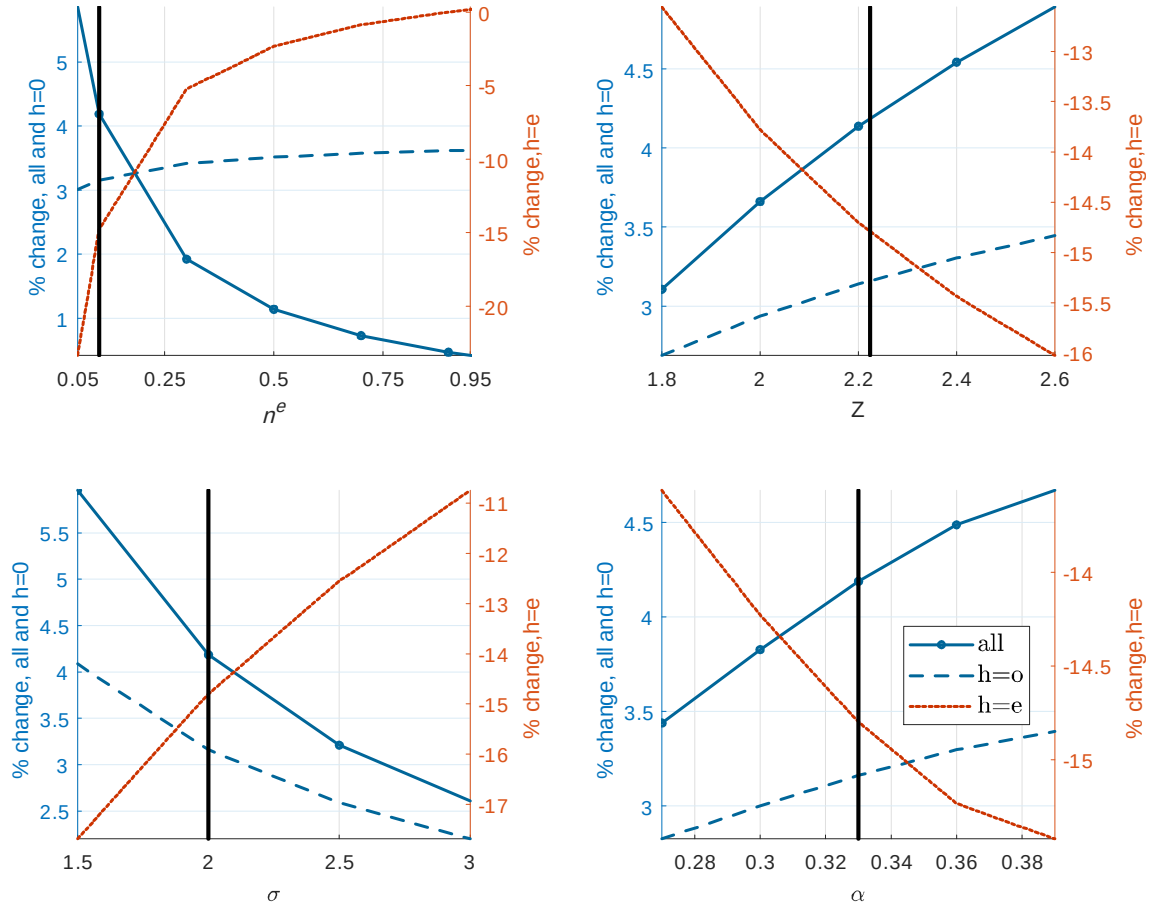


Note: The figure shows the percentage change in wealth Gini from θ=0 to θ=0.0046 for r and w associated with θ=0.0046. The thick vertical lines correspond to the calibrated values of the parameters in the benchmark calibration.

Next, we turn to the general equilibrium distortions, which arise because capital and labour are misallocated, leading to reductions in aggregate capital and firm productivity, implying declines in the interest and wage rates. Regarding the interest rate, this happens first because a share of aggregate savings are diverted away from production (there is an income loss for the financial sector that reduces the market return (r) directly), as can be seen in equation (6). Second, because of the reallocation of a share of labour to the rent seeking intermediation sector, the labour input used in production is reduced, and thus the marginal product of capital is reduced, hence tending to reduce r^f and r. On

the other hand, since there are fewer assets available to firms (due to extraction), the marginal product of capital tends to increase r^f. However, the negative effects dominate in the results in Table 3, so that r falls. Regarding the wage rate, the reduction in the amount of capital used for production (because a proportion θ is extracted) also implies a reduction in the wage rate (w), since labour productivity is increasing in capital. On the other hand, since there is less labour input available to firms (because of the reallocation to the rent seeking intermediation sector), the marginal product of labour tends to increase. However, again, the negative effects dominate in the results in Table 3, so that w falls (see also Appendix Figure B.2).

Figure 4: Change in wealth Gini from $\theta = 0$ to $\theta = 0.46\%$



Notes: The figure shows the percentage change in wealth Gini from θ=0 to θ=0.0046. The thick vertical lines correspond to the calibrated values of the parameters in the benchmark calibration.

In Figure 4, we plot the proportional increase in the Gini index for rent seekers, non rent seekers, and the whole economy, from $\theta = 0$ to $\theta = 0.0046$, against four parameters that capture essential aspects of rent seeking effects on inequality. In Appendix B we also plot the effects on the interest and wage rates. We start by examining the impact on within-group inequality for non rent seekers. Note that for all cases considered, the general equilibrium effects imply an increase in within-group inequality for this group, as analysed in Section 3.6.

First, regarding n^e, a more exclusive rent seeking implies a smaller increase in aggregate wealth due to rent seekers' increased savings[25], and thus a smaller pressure on r. In turn, this leads to a smaller decrease in savings for non rent seekers[26], and a smaller increase in wealth inequality, as explained in Section 3.6. Second, a higher Z implies a bigger increase in savings for rent seekers (as explained in Figure 3) and a smaller labour misallocation to the rent seeking intermediation sector. In turn, these two channels tend to amplify the reduction in r but slow down the reduction in w. The effect via the interest rate dominates and implies that a typical non rent seeker accumulates less wealth, which, as explained in Section 3.6, in this environment leads to higher wealth inequality within non rent seekers. Third, an increase in the risk aversion parameter σ implies stronger incentives to save (to smooth consumption fluctuations) for given returns and income, and thus implies that savings are less sensitive to changes in r and w. As a result, wealth inequality within non rent seekers increases by less as σ increases. Finally, a higher relative productivity of capital in the production function, a, implies that rent seeking reduces the wage rate, w, by more and reduces the return to savings, r, by less (see Appendix Figure B.2). For non rent seekers, who have less wealth and depend more on their labour income, this implies that the larger reduction in the wage rate because of rent seeking is more harmful to their savings, thus rent seeking under higher a reduces wealth accumulation more for a typical non rent seeker, leading to larger increases in within-group inequality.

We continue with within-group inequality for rent seekers. For n^e and Z, the general equilibrium reduction in r with higher n^e and Z works to mediate but not change the sign of the group-specific effects. For σ, the direction of effects is similar (and for the same reasons) as with non rent seekers, i.e. there is less change in savings behaviour, and thus in inequality, for higher σ. Finally, an economy with higher capital to output ratio (i.e. a higher a), also implies higher returns to rent seeking because the rent seeking pie (total assets) increases. This effect is more important than the reduction in r, so that the effects of a higher a (and thus A) on $\widetilde{r}^e$ are similar qualitatively to those of a higher θ, working to decrease within group wealth inequality (see Section 3.6).

Finally, we examine changes in overall inequality, which is determined by changes in between and within-group inequality. Regarding n^e, inequality increases with more exclusive rent seeking, reflecting the big increases in between group inequality. For the remaining factors, note that the reasons that tend to increase within-group inequality for non rent seekers, and decrease it for rent seekers, also work to increase between-group inequality. Because of the magnitude of the latter, and because non rent seekers are a relatively bigger share in the population, overall inequality in these cases follows within-group inequality for non rent seekers.

To summarise, factors that tend to increase the strength of the adverse general equilibrium effect of rent seeking on savings (the relative importance of capital in production or the effectiveness of the rent seeking sector) tend to increase the inequality effects of rent seeking. On the other hand, preferences (risk aversion) that make savings less dependent on resource misallocation, imply that general equilibrium effects are smaller and thus lead to a lower increase in inequality. Overall, for empirically plausible ranges of parameters, we find that wealth inequality at the economy-wide level increases with rent seeking.

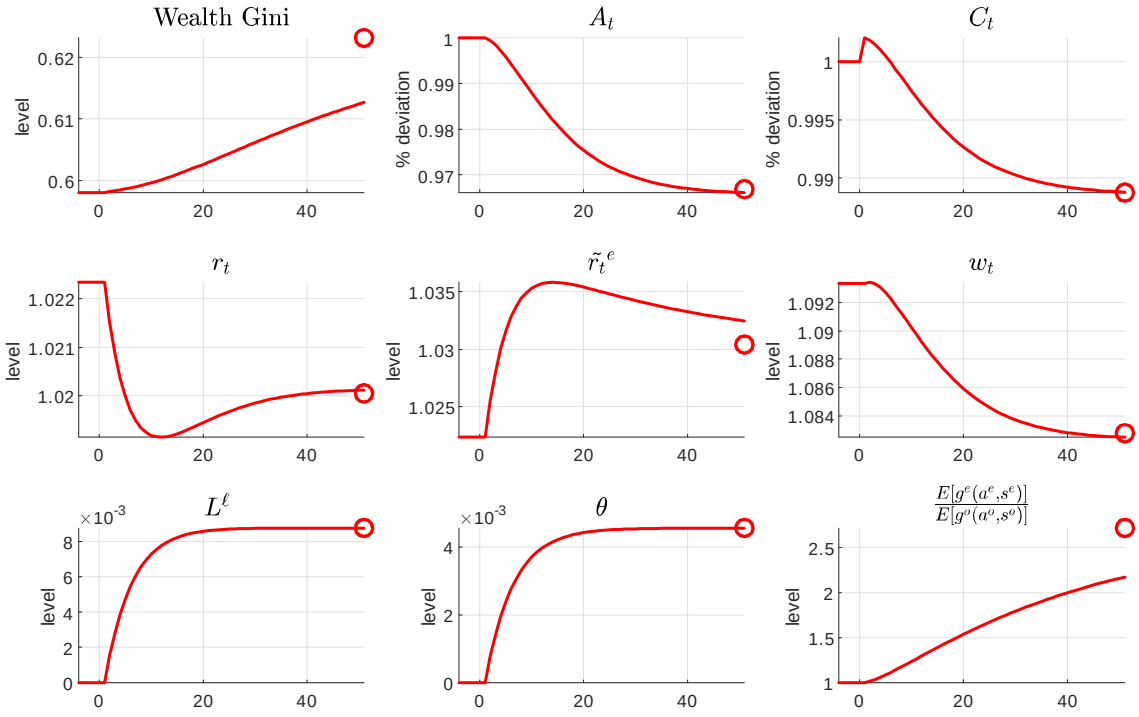
[25] The total wealth owned by rent seekers is lower because they are a smaller share of the population, even though mean wealth for a typical household in this group increases.

[26] The drop in the wage rate is also lower for lower n^e, which tends to increase savings, but the drop in the interest rate dominates.

4.1.2 Welfare gains/losses from rent seeking when institutions change

We next examine the dynamic effects of changes in the quality of institutions. This exercise allows us to evaluate the dynamic predictions of the model regarding the relationships between institutional quality, rent seeking activity and wealth inequality, and compare these to the time series evidence in Section 2. In Figure 5, we plot the general equilibrium paths assuming that the economy is in the stationary equilibrium summarised under $\theta = 0$ in Table 3, and at time zero, it becomes known to all households that over the following 30 years, the quality of institutions will deteriorate smoothly so that in 30 years $\theta = 0.0046$. We compute the transition to this new stationary equilibrium (for details, see Appendix B). As can be seen, rent seeking and lobbying activities increase over time, accompanied by a deterioration in aggregate quantities and increased wealth inequality. The correlations implied by the time series in Figure 5 are consistent with the evidence in Section 2.

Figure 5: Transition dynamics of an increase in θ

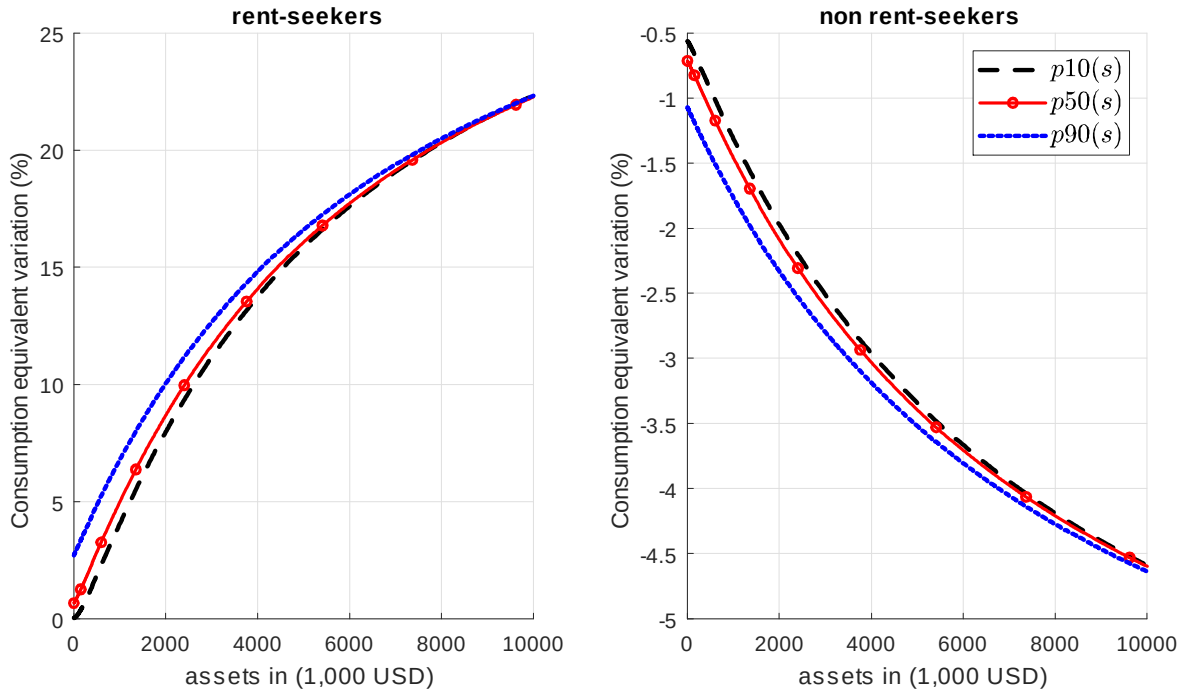


Notes: The circles in each plot in the the last periods indicate the levels in the final steady states (θ=0.00462).

We also examine the distribution of welfare gains/losses, conditional on initial wealth, for each class. We calculate the conditional welfare change for all households on the cross-sectional distribution associated with the stationary economy for $\theta = 0$, resulting from the transition that follows the deterioration in the quality of institutions in Figure 5 (see Appendix B for details). In Figure 6, we plot the consumption equivalent variation, conditional on initial assets and earnings, $v(a, s)$, defined as the percentage change in consumption required to be given to the household under the stationary equilibrium for $\theta = 0$, so that it is indifferent between remaining in this economy as opposed to the economy that follows the transition paths in Figure 5. Hence, a greater positive number

implies larger welfare gains from rent seeking. We plot welfare gains/losses for three levels of earnings to facilitate presentation, approximately for the 10%, 50% and 90% percentiles. We plot the relevant distributions for each of the two classes, rent seekers and non-rent seekers, under the initial economy.

Figure 6: Conditional welfare gains from $\theta = 0$ to $\theta = 0.46\%$



Note: The scale of the x-axis is obtained by transforming assets in USD, by multiplying by real mean family income in 2015 expressed in 2019 prices as measured by CPI-U-RS.

The first main result from Figure 6 is that an increase in rent seeking implies welfare gains (losses) for the class of rent seekers (non-rent seekers), for all levels of initial wealth and earnings within each class. Therefore, everyone in the class of rent seekers benefits from rent seeking, whereas everyone in the class of non rent seekers loses. As already discussed, the benefits for the former group result from achieving higher returns for their savings. At the same time, the losses for the latter are a result of the deterioration of economic productivity, implying a reduction is aggregate returns to saving and working.

The second main result from Figure 6 is that these gains and losses are not distributed equally. Instead, welfare gains for rent seekers are an increasing function of earnings and initial wealth. Those with higher earnings and initial wealth can accumulate more wealth and thus extract more resources via the rent seeking competition along the transition to the new stationary equilibrium (recall that rent extraction is proportional in own wealth). On the other hand, the non rent seekers who lose the most from rent seeking are those with high earnings and high wealth, because the deterioration in the aggregate economy has a bigger impact on their income. These wealthy and high earnings households, who are excluded from the rent seeking competition, will be the big winners of reforms to reduce rent seeking, while for poorer households the benefits are much smaller. Conversely, the big losers from reforms to reduce rent seeking will be the wealthy rent seekers, who extract

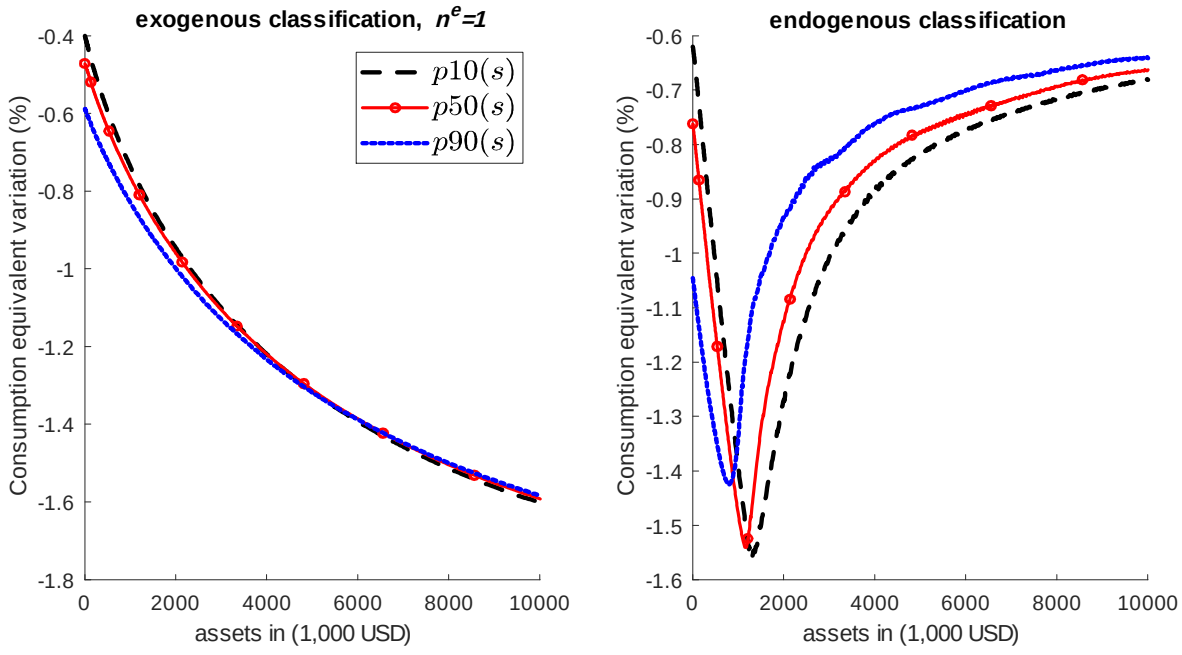
most of the resources.

A relevant research programme has examined the distributional implications of fiscal policy reforms, within the class of heterogeneous agent models, by computing conditional welfare changes for households with different initial conditions over a deterministic dynamic path for policy instruments (e.g. Domeij and Heathcote (2004), and Kitao (2008)). The wedge in the returns to savings, caused by financial rent seeking and affecting mainly the non rent seekers (who do not have benefits from rent seeking to trade off this loss), works, in effect, as an implicit tax on savings. Viewed in this respect, the effect of rent seeking, which reduces welfare monotonically with initial wealth and earnings for the non rent seekers, is similar to the welfare reducing effect of capital income taxation (see, e.g. Figure 6 in Kitao (2008)).

4.2 Endogenous determination of insiders and outsiders

So far, the population fraction of rent seekers (n^e) has been set exogenously. In this subsection, we explore the endogenous determination of n^e, by allowing whether a household belongs to the group of rent seekers, or not, to be a function of a variable that can be affected by that household's decisions.

Figure 7: Conditional welfare gains, inclusive rent seeking, from $\theta = 0$ to $\theta = 0.46\%$



Note: The scale of the x-axis is obtained by transforming assets in USD, by multiplying by real mean family income in 2015 expressed in 2019 prices as measured by CPI-U-RS.

To demonstrate the importance of exogenous versus endogenous rent seeking opportunity, we consider as an illustration a stylised environment where the criterion that determines the existence of benefits from rent seeking activity is whether a household's wealth is above or below a threshold level for wealth.[27] In this environment, heterogeneity

[27] We present this extension as an illustrative counterfactual because it is difficult to specify and

in returns, due to rent seeking, arises endogenously. We choose wealth as the variable defining the determination of the rent seeking group, because, as noted in Section 2, the link between status and wealth is strong. In this economy with inclusive rent seeking and endogenous heterogeneity in returns to wealth, the latter are increasing in wealth for a given household, driven by returns from rent seeking.

We assume that the ability to extract resources from the financial sector requires a form of socio-political capital, which is a function of relative wealth, and can be augmented by specific expenses, earmarked to improve one's social network. Such expenses, for example, can be joining the right club, frequenting the right venues, and attending the right events, which are undertaken to gain access to the network required to participate in financial rent seeking and appropriate resources. In terms of the model developed in Section 3, this implies that the household i, as a rent seeker, faces the constraint:

$$d_t^i \theta A = q\left(H\left(a_t^i, e_t^i\right)\right), \tag{13}$$

where e_t^i denotes i's expenses for increasing social networking, $H\left(a_t^i, e_t^i\right)$, which is assumed to be non-decreasing in its inputs, and the non-decreasing function $q\left(H\left(a_t^i, e_t^i\right)\right)$ models the transformation of $H\left(a_t^i, e_t^i\right)$ to actual rent seeking. Hence, (13) implicitly defines e_t^i as a non-decreasing function of $d_t^i \theta A$ and a non-increasing function of a_t^i. Therefore, the budget constraint of the typical household (note that now households are *ex ante* identical) becomes:

$$c_t^i + e_t^i + a_{t+1}^i = (1+r)\, a_t^i + w s_t^i + d_t^i \theta A - p_\ell d_t^i \theta A, \tag{14}$$

where e_t^i must satisfy (13). To capture threshold effects leading to rent seeking classes, we assume that one's wealth, a_t^i, determines e_t^i via (13), by determining the class that the household belongs to in terms of rent seeking. In particular, we assume that the functional form for (13) implies that:

$$e_t^i = 1_{a_t}\left(1 - p_\ell\right) d_t^i \theta A,\ 1_{a_t} = 1, \text{ if } a_t^i < \phi A, \text{ else } 1_{a_t} = 0.$$

Hence, the higher the parameter value ϕ, the more exclusive the wealth/social class that benefits from rent seeking, since everyone below the threshold level of wealth makes zero net gains from the rent seeking competition - they are, in effect, excluded from rent seeking benefits. However, compared with the base model in Section 3, these households are now allowed to join the rent seeking group, should they accumulate enough wealth over time. To proceed with the quantitative analysis, we re-calibrate the model parameters, working as described in Section 3, by choosing ϕ so that about 10% of the population is above the threshold in equilibrium. This target implies a value of $\phi = 2.9$.

Results from this model, where rent seekers emerge in equilibrium from households that are *ex ante* identical in their opportunity to participate to rent seeking, are summarised in Table 5, and the distribution of conditional welfare gains/losses in Figure 7.[28] For comparison, we also summarise in Table 5 and Figure 7 results from a version of the base model in Section 3 in which all households are *ex ante* identical as rent seekers, by setting

calibrate, in this framework, the latent relationship that gives rise to the emergence of rent seeking elites. The specification we use below captures key qualitative features.

[28] Note that under $\theta = 0$, the quantities for the rent seeking group $h = e$, refer to the household group above the threshold level of wealth, which is 8.1% of the households in this case.

$n^e = 1$ in that model. In this case, everyone is a rent seeker and the rate of return to savings is independent of own wealth. Here the general equilibrium distortions are strong enough to overturn the positive incentives arising from financial rent seeking for asset accumulation. As shown in Table 5, when $n^e = 1$ assets are reduced on average and wealth inequality is increased under $\theta = 0.0046$.[29]

Table 5: The effects of financial rent seeking, inclusive rent seeking.

	endogenous classification		exogenous class. $n^e = 1$			endogenous classification		exogenous class. $n^e = 1$	
θ	0.46%	0%	0.46%	0%		0.46%	0%	0.46%	0%
Gini	0.628	0.599	0.601	0.598	K^f	4.214	4.393	4.245	4.392
Top 40%	0.866	0.845	0.847	0.844	L^f	0.991	1	0.991	1
Top 10%	0.413	0.389	0.390	0.387	p_ℓ	0.490	-	0.487	-
Top 1%	0.070	0.067	0.067	0.066	r	0.020	0.022	0.020	0.022
Gini $h = e$	0.155	0.148			$\widetilde{r}$	0.023	0.022	0.022	0.022
Gini $h = o$	0.577	0.557			r^f	0.025	0.022	0.025	0.022
$\frac{E[g^e(a^e,s^e)]}{E[g^o(a^o,s^o)]}$	6.520	5.749			w	1.080	1.092	1.083	1.092
$E[g^e(a^e, s^e)]$	17.644	18.209			Welfare	-0.979	-0.961	-0.971	-0.961
$E[g^o(a^o, s^o)]$	2.706	3.167							
wealth share of RS	0.426	0.338							

Under the endogenous classification to the rent seeking class, the wealth inequality implications are effectively as big as under *ex ante* heterogeneity in rent seeking classification and higher than in the situation where everyone is a rent seeker *ex ante* (compare the results in Table 5 with those in Table 3). In this sense, therefore, whether heterogeneity in returns to wealth from rent seeking is pre-determined or arises endogenously (because returns are an increasing function of wealth) does not matter much for wealth inequality results. On the other hand, by comparing the results from the two specifications in Table 5, we see that if the rate of return is an increasing function of wealth, then the wealth inequality implications of rent seeking are bigger, compared with the situation where the rate of return from rent seeking is independent of own wealth.

Moreover, all households are worse off by an increase in rent seeking under inclusive rent seeking (see Figure 7), which is different under *ex ante* heterogeneity, where the group of rent seekers gains (see Figure 6). Under inclusive rent seeking, even those who are rent seekers under $\theta = 0.0046$, would have gained from the increased market returns to savings following a potential reform to eliminate rent seeking. Therefore, mobility in the wealth ladder under stochastic earnings, and by implication mobility in the rent seeking ladder, should lead to wider support for reforms that improve institutions. In this sense, persistence of institutions that permit rent seeking can be linked more to non-market socio-political immobility, exemplified in the base model with fixed classes, rather than to an endogenous classification system where one's relative wealth determines the ability to join the rent seeking class.

[29] In Appendix C, we also present a simple model with *ex ante* identical households that demonstrates the importance of the distortions implied by rent seeking at the general equilibrium level as a driver of inequality.

4.3 Policy intervention

Finally, we examine the distributional implications of taxation of the rent seeking sector in the base economy with group heterogeneity presented in Section 3. In particular, we examine the implications of a tax rate $\tau^l = 10\%$ that is imposed on the output of the rent seeking intermediation sector[30], which changes the respective optimisation problem to:

$$\eta^\ell = \left(1 - \tau^l\right) p_\ell Z L^\ell - w L^\ell, \tag{15}$$

implying that the tax tends to increase p_ℓ. The results from these policy experiments are summarised in Table 6, where, in the first column, we repeat the relevant results from the base case in Table 3 for ease of comparability.

Table 6: Tax on the rent seeking intermediation sector

	Bench	tax 10%		Bench	tax 10%
Gini	0.623	0.620	K^f	4.245	4.237
Top 40%	0.862	0.859	L^f	0.991	0.991
Top 10%	0.415	0.413	p_ℓ	0.487	0.541
Top 1%	0.078	0.076	r	0.020	0.020
wealth share $h = e$	0.232	0.220	$\widetilde{r}$	0.030	0.030
Gini $h = e$	0.510	0.515	r^f	0.025	0.025
Gini $h = o$	0.617	0.615	w	1.083	1.082
$\frac{E[g^e(a^e,s^e)]}{E[g^o(a^o,s^o)]}$	2.717	2.540	Welfare	-0.975	-0.976
$E[g^e(a^e, s^e)]$	9.888	9.369	Welfare $h = e$	-0.835	-0.847
$E[g^o(a^o, s^o)]$	3.640	3.689	Welfare $h = o$	-0.990	-0.991

The tax on the rent seeking sector decreases overall wealth inequality, by decreasing between-group inequality and within-group inequality for the non rent seekers, despite an increase in within-group inequality for the rent seekers. It also decreases aggregate welfare, but it improves welfare for most of the population, namely, the non rent-seekers. The welfare gains for non rent seekers are relatively small. By increasing p_ℓ, it reduces asset accumulation for the rent seekers, which further explains the rise in within-group inequality and the decline in average welfare within this group, and contributes to the decline in between-group wealth inequality. However, the decline in the supply of assets from this group implies that the market return to savings increases, which increases the supply of assets from the non-rent seekers.[31] In turn, this explains the drop in within-group inequality and the rise in welfare in this group, contributing to the fall in between group and overall inequality.

5 Conclusions

In this paper, we considered an incomplete markets heterogeneous agent model where a share of accumulated assets was diverted away from productive uses to a subset of

[30] To focus on the effects of taxation and partial out effects of public spending we assume that the tax revenue is used to provide a good that does not enter the household's utility function.

[31] See also Angelopoulos *et al.* (2020) for a different example of general equilibrium effects of savings from *ex ante* heterogeneous groups, working via the interest rate.

households via rent seeking competition favouring the wealthy. In particular, we assumed that the amount of resources that can be extracted by the households with privileged access to rent seeking increases with their wealth, relative to aggregate wealth. We studied both inclusive and exclusive rent seeking.

For households that have the opportunity to rent seek, rent seeking creates incentives to increase savings, reducing responsiveness of asset accumulation to idiosyncratic variation in earnings. Conditional on aggregate quantities, this mechanism implies that financial rent seeking works to decrease wealth inequality among rent seekers. However, rent seeking also implies a misallocation of resources at the social or aggregate level because rent seeking reduces directly the amount of savings that can be used for production, and indirectly the amount of labour that can be used for production. The latter happens because rent seeking requires intermediation in the form of lobbying services, and financial and legal advice, which absorb labour services from the producing sector. These effects tend to reduce market returns to savings and household income, and thus the incentive and ability of households to accumulate assets and self insure, working to amplify the effect of idiosyncratic earnings shocks on wealth inequality. Therefore, the general equilibrium effects of rent seeking work to increase wealth inequality among non rent seekers and increase inequality between the groups of rent seekers and non rent seekers.

We calibrated the model to US data, and we found that a deterioration in institutional quality, implying increased rent seeking activity, leads to increased wealth inequality. Furthermore, rent seeking elites, who enjoy exclusive access to financial rent seeking, also enjoy wealth and welfare gains, while non rent seekers face losses that are increasing in wealth and earnings. On the contrary, in the case of inclusive rent seeking in which the opportunity to appropriate resources from rent seeking is open to all households, rent seeking is harmful to all, even to those who make resource gains via rent seeking. Overall, our results underline the importance of the general equilibrium distortions and exclusive privileges to rent seeking as the main drivers of wealth and welfare inequality. They also suggest a link between the persistence of socially inefficient institutions that permit rent seeking and socio-political immobility.

We close with modelling caveats and possible extensions. Rent seeking can increase wealth inequality for additional reasons that we did not study here. These may include, for instance, stochastic returns to rent seeking, especially in relation to earnings risk, or a different type of asset being necessary for rent seeking. Also, here we took institutional quality, as summarized by the economy's degree of property rights, as given. As is recognized, however, institutions are endogenous, so that a natural question is why societies choose or end up with socially inefficient institutions that do not maximize the welfare of the majority (see, e.g. Acemoglu (2006, 2009) and Rajan (2009)).

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