The Origin of Democracy in Athens

Bryan C. McCannon[1]
Wake Forest University

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Abstract

A new explanation of the origin of democracy is presented motivated by historical observations from ancient Athens. It is argued volatility in wealth across generations encouraged the elites to extend the franchise to nonelites. While being among the elite allows for the extraction of wealth from the nonelite, if there is a significant probability one's offspring will fall from the ranks of the elite, then the enfranchised may have the incentive to provide democracy. This improves an insurance for one's offspring. Furthermore, providing this protection allows in certain environments an individual to consume more in one's life.

Keywords: Athens, democracy, wealth volatility

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As a moneymaker, I [Cephalus] was sort of a mean between my grandfather and my father. For my grandfather, whose namesake I am, inherited pretty nearly as much substance as I now possess, and he increased it many times over. Lysanias, my father, used it to a point where it was still less than it is now. I am satisfied if I leave not less, but rather a bit more than I inherited, to my sons here (Plato, *The Republic*, Book I, line 220b).

1 Introduction

The puzzle of the origination of democracy is an intriguing one. Why would those with the power to extract resources (money, land, labor, etc.) volunteer to share this power with those whom they may extract from? A full understanding of this question is crucial to appreciate the derivation of our modern democratic institutions and to assess the consequences and potential solutions to civil conflicts within countries today.

A number of explanations have been provided (which will subsequently be reviewed). The objective here is to provide another potential explanation for the origin of democracy. The motivating historical society is ancient Athens. In fact, it was the Athenians with the laws of Draco, the creation of democratic institutions of Solon, the constitution of Kleisthenes, and the reforms of Ephialtes that first introduced democracy to the Western world. Evidence is presented of significant volatility in wealth levels across the generations of Athenian elite families. It is argued here that the provision of democracy can be explained as a mechanism beneficial to not only the nonelites of ancient Athenian society, but also to elites who are interested in both their own well-being as well as the well-being of their offspring.

A theoretical model is presented of an individual determining lifetime con-

sumption. Increased consumption directly improves that individual's utility, but reduces the amount bequeathed to his offspring whom he cares about, as illustrated in the opening quote. To an elite oligarchy is attractive since those in power are able to extract from the nonelite to increase their wealth. Democracy, which provides decisionmaking power to those who would have been exploited, reduces the amount available for the elite to consume. Alternatively, to an elite democracy has the advantage of improving the quality of life of one's offspring if intergenerational shocks to wealth reduces his child's wealth to levels below elite status. It is shown that democracy, by providing this partial insurance to one's offspring, allows for an elite of the society to consume higher amounts during one's life, since he no longer needs to protect his offspring as much as what would be required in an oligarchy. The tools of stochastic dynamic programming are used to illustrate the conditions under which the benefits of democracy to the elite outweigh the benefits of oligarchy. Thus, volatility in wealth across generations provides another potential explanation for the origination of democracy.

This work contributes to the growing literature on the economic analysis of classical Greek institutions. Kyriazis (2009) and Kyriazis and Zouboulakis (2004) have investigated the public financing of the Athenian navy. Kaiser (2007) models the procedure used to contest a *liturgy* (tax payment responsibility). Bitros and Karayiannis (2008) and Karayiannis and Hatzis (2007) investigate the role of social norms in entrepreneurship and the legal system respectively. Fleck and Hanssen (2006, 2009) contribute to the economic analysis of democracy (as will be reviewed later). The economic analysis of the legal system includes a formal model of the *timetos* procedure used to

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convict Socrates (McCannon, 2010b), screening in homicide trials in Athens (McCannon, 2010a), and the determination of jury size (McCannon, 2011).

Section 2 discusses the literature on the extension of the franchise relating the work presented here to the others previously introduced. Section 3 provides evidence of the volatility of wealth across generations and ancient Greek reactions to this uncertainty. Section 4 presents the theoretical model, while Section 5 derives the optimal consumption and bequests. Section 6, then, discusses the choice of providing democracy given the results presented and Section 7 concludes.

2   The Provision of Democracy

The literature on the provision of democracy has provided a number of theoretical explanations. Acemoglu and Robinson (2000) argue that the extension of the franchise is a strategic decision to prevent social unrest. The poor can revolt and take possession of the resources of the elite. This revolution, though, is destructive. The elite may be interested in negotiating with the nonelite, but without the ability to commit to increased taxation such a compromise may be unsuccessful. Democracy provides the commitment necessary to eliminate desire for revolution. They identify the environments under which the franchise is extended to the poor of the society. Acemoglu and Robinson (2001) allow for both the nonelite to revolt and the elite to mount a coup to eliminate a democracy. Thus, they are able to distinguish between a consolidated democracy and an unstable regime which oscillates between revolutions and coups. In their theoretical framework they identify the environments under which nondemocracy, a consolidated democracy, and

a society which continually switches regimes exists. In both frameworks the distribution of rich and poor is exogenously fixed and, therefore, they do not consider volatility in wealth and the possibility of switching status.

Alternatively, those in power may have better information regarding the spoils of power than do the outside challengers. The offer attempting to co-opt the challengers serves as a signal. Dal Bó and Powell (2009) develop this idea and illustrate that conflict is more likely when income is low, the strength of the opposition is strong, and conflict is less destructive. Ellis and Fender (2009, 2010) incorporates capital investment into this framework to explain the effects on growth and the political development trap. In these arguments it is class conflict which leads to democracy.

Other theories of the origin of democracy look for conflict between those in power. Lizzeri and Persico (2003) argue that elites may wish to extend the franchise to steer politicians away from policies that serve only small constituents towards those with more diffuse benefits. Llavador and Oxby (2005) develop a theoretical model where the group of elite have conflicting interests. They look to disenfranchised groups for support for their preferred policies. Consequently, the search for support from the nonelites leads to both democratization and growth.

Alternatively, democracy may provide good incentives for the nonelite. The nonelite's response, i.e. additional investment or effort, may have positive spillovers for the elite of a society, which may compensate them for the loss of power. Jack and Lagunoff (2006a, 2006b) develop this point and derive the environments in which the elite are motivated to voluntarily extend the franchise. Thus, there may be internal gains to democracy that provide

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the rationale for its provision, rather than external conflict.

The explanation for the origination of democracy in Athens as well as the nonprovision in other ancient Greek cities such as Sparta is addressed specifically by Fleck and Hanssen (2006). They argue that it is the agricultural output and terrain which determined the form of government in ancient Greece. The production of olives in Athens requires a significant amount of time. It takes at least eight to ten years from the time a sapling is planted for it to bear its first fruit (Foxhall, 2007). Furthermore, the hilly terrain makes monitoring difficult. Thus, the Athenian elite faced a moral hazard problem: how can the nonelites be provided the incentive to exert (unobservable) effort? The time inconsistency problem of being unable to commit not to extract the fruits of the *demos*' labor ("people's") lead to the provision of democracy. In Sparta, on the other hand, grain production does not require long-term investments and the flat plains allowed for monitoring and coercion. Thus, the Spartan elite need not provide democracy. Fleck and Hanssen (2006) build a theoretical model of the interaction between elites and nonelites who differ in their preferences for public and private goods to capture the role of democracy in dealing with the complementary problems. Fleck and Hanssen (2009) provide a similar analysis to explain the rise of women's rights in Sparta. Legal rights provided women the incentive to properly manage the family estates and allowed for an improved allocation of labor in society.

It is not clear whether these explanations for the rise of democracy fully explain the Athenian experience. Elements of each are prevalent, though,

in the history of the city.[1] Class conflict was severe in the time of Solon; "the majority were the slaves of the few" (Aristotle, *The Constitution of Athens*). The practice of using one's freedom as collateral for loans had resulted in widespread debt bondage. Solon in 594 B.C. created a new set of laws and democratic institutions. While debt bondage was made illegal and debts were canceled, much of the political power was retained by the upper classes. The *Boule*, a council of 400 that set the agenda for the popular assembly (*Ekklesia*), was created. The Council of the Areopagus, which likely consisted of aristocrats, "watched over the laws" and had "important supervisory powers". They could impose punishments and fines without a stated reason. Formal citizenship classes were established. Membership in a particular class was strictly determined by the amount of agricultural output. Only those of the higher classes were allowed to hold an office and the lowest classes, referred to as the *thetes*, could only be members of the *Ekklesia* and the popular lawcourt. Other than significant economic gains the nonelites only gain in their political power was the right to appeal. Thus, as in Acemoglu and Robinson (2000), a compromise falling short of full democracy was provided.

The next significant step in the process of democratization was the constitution of Kleisthenes (508 B.C.). A tyranny had replaced the government created by Solon. The tyrant was removed with Spartan aid. Conflict between two groups of elites resulted in the exile of one (the Alkmeonids), but when the other (lead by Isagoras) attempted to take control of the govern-

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[1]A full history of the political reforms and institutions in ancient and classical Athens is not attempted here. Only a summary is. One is encouraged to consult Rhodes (2006) as a source for details.

ment, "the people gathered ... [and] had taken control of affairs" (Aristotle, *The Constitution of Athens*). Kleisthenes, leader of the Alkmeonids, created a new constitution "so that more might share control of the state". Citizens were organized into *demes* (political districts) based not on heredity, but on geography. *Demes* from the three distinct regions; the city, the country, and the coast; were grouped together and organized into ten tribes. The *Boule* was extended to include 500 (fifty from each tribe). Thus, power was transferred away from family lines and connections. Furthermore, the institution of ostracism was introduced. Ostracisms in Athens were banishments from the *polis* for ten years (MacDowell, 1978). This gave the citizens the power to expel political leaders who supported unpopular agendas or who were too powerful. Thus, external intervention, conflict between the elite, and class conflict come together to explain the second step in the gradual enfranchisement of the Athenian citizens.

The theories of conflict among the elite have additional relevance to Athens. In 462 B.C. Ephialtes successfully reformed the Council of the Areopagus. Ephialtes' reforms occurred under a situation of elite conflict. Those favoring the reforms, which included the famous statesman Perikles, were able to ostracize the leader of the opposition, Kimon. With the opposing elites reduced in strength Ephialtes proceeded to use the judicial system to remove the opposition from the Council of the Areopagus. Previously the Council had primary judicial control. With his reforms the determination of guilt and innocence and the imposing of sanctions were done by a representative body of citizens. In fact, the typical jury size was 500 (McCannon, 2011). By transferring the power of the Council to the *demos* support for

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policy, specifically Perikles' policies of the 5th century, was obtained.[2] These reforms took place, though, after democracy had been created and were a redistribution of the power amongst the citizens of the democracy. Thus, conflict amongst the elite cannot fully explain the origin of democracy.

Finally, the theories of internal sources of incentives to provide democracy have been applied specifically to Athens by Fleck and Hanssen (2006). As stated, their results rely on the prevalence of olive production in ancient Athens. The importance of olives and its causal relationship to the political organization of the society, though, can be called into question. Foxhall (2007) provides a detailed case study of olive production in ancient Greece. She argues that "there is little solid evidence for the large-scale specialized production of Attic olive oil or trade in it" (p.78). Olives were not a staple of the ancient Athenians. They were produced primarily by the wealthy because (1) labor needs were erratic and best done by slaveholders, (2) the storage of surplus can only be done by the elite, and (3) fragmented land holdings lead to the preponderance of mixed farming. The bulk of the population was engaged in subsistence agriculture. Olive crops are notoriously unreliable and unpredictable from year to year. They required significant and lumpy labor inputs. The mass production and widespread use of olives did not occur until the time of the Romans (Foxhall, 2007). Many Athenian citizens owned no land and most of those that did own land owned small parcels in which necessary crops, such as grains, were grown. She argues that figs, which require much less time and labor and have a higher calorie content were likely

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[2]Such policies include restricting citizenship to those born of two citizens, pay for attending the *Ekklesia* and serving on the jury, the expansion of the Athenian empire (Delian League), the building of the Akropolis, and a trade embargo on Megara, among others (Kagan, 1998).

the tree crops that the nonwealthy included to diversify their agricultural output. The wealthy were able to make the long-term investments to grow olives and, along with food, used the olives produced for lighting and personal cleaning and adornment. Olives served as a status symbol and were in short supply. Consequently, Foxhall (2007) is left to conclude that "the olive is not a causal agent in itself" (p.15).

Therefore, while an important agricultural crop for Athenian society and the economic dilemma that it creates can help explain some of the reason members of the elite were willing to share political power, it is not clear that the three theories discussed provide a full explanation of the creation of democracy in Athens.

Interestingly, though, the olive as a representative output in the society may provide an insight into a primary motivation for democracy in Athens. Olives take twenty-five to thirty years until they reach full production (Foxhall, 2007). The use of surplus labor resources in activities such as olive cultivation increased the value of the land for future generations. Foxhall (2007) concludes that "a man plants [olives] aiming to feed his grandchildren" (p.248). Isiaos provides evidence of this stating, "my father planted [the patrimonial land] in trees and cultivated and made it double in value" (Isiaos 9, line 28). The issue of the inheritance of wealth, including the lands and its productive possibilities, is an important feature and is valued in Athenian society, as illustrated in the opening quote.

3 Volatility of Wealth

The objective of this work is to provide a new explanation for the origination of democracy; one that can explain, specifically, the rise of the institution in ancient Athens. The primary observation that motivates the theoretical results presented here is the empirical observations made by Davies (1981). By the classical period (478-322 B.C.) most democratic institutions had been implemented. The elite secured for themselves rights to the influential positions in the society, while much of the legislative and judicial power was shared with the *demos*.

The burden of financing publicly-provided goods fell on the richest families in the city. This class of elite was referred to as *leitourgountes* (Cohen, 1992). Each year families were selected to pay taxes for important public goods. A *liturgy* is when a wealthy family is designated to outfit a *triereme* for the Athenian navy.[3] The designated taxpayer covered the supplies and salaries of the crew. During the fourth century men whose property was worth less than three talents were free from liturgical obligations. Of those who were not released from this obligation the 400 richest families were assigned to occasionally perform the *liturgy*. This number was reduced to 300 in the fourth century (Davies, 1981). This propertied class made up approximately 1-2% of the Athenian citizens and represents the top of the Athenian economic structure. Davies (1981) collected data on contributions made by *leitourgountes* over the period circa 600 B.C. to 300 B.C., which includes both the ancient and classical period. The data set consists of five generations of

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[3]Liturgies were also used to fund other public goods such as public performances and entertainment.

Athenian families.

He showed that there was significant volatility in the makeup of this class of elites. In fact, only one family can be identified to be in the wealthy, elite class during the entire period. Table 1 presents the distribution of families and their longevity in the class of elites (Davies, 1981, p.86).

Table 1: Wealth Volatility

# of generations in liturgical class	# of families	% of families
5	1	0.2%
4	5	1.2%
3	16	3.8%
2	44	10.4%
1	357	84.4%

Thus, for the overall sample most families spent one generation in the liturgical class, while only a small minority remained amongst the ranks of the elite for more than two generations (5.2%). To elaborate, for the generation who were socially/politically active in the years 366-333 B.C. (the fourth generation of the sample) 117 families can be traced. Table 2 presents the distribution of this group of families across the number of previous generations who were also of an elite status.

Table 2: *Leitourgountes* (366-333 B.C.)

# of generations in liturgical class	# of families	% of families
4	1	0.9%
3	5	4.3%
2	20	17.1%
1	91	77.8%

A number of explanations can be given for this dramatic volatility in elite status over the generations in ancient and classical Athens. Davies (1981) provides two causes. First, family disappearance through, for example, childlessness can explain the departure of a family from the list. Second, economic shocks to the family's wealth can occur. Examples of economic shocks he lists include:

- overseas landholding, which was common for Athenian elites as they gained military victory, could be lost (e.g. local revolt)

- landed property normally leased out to tenants might cease to be a source of revenue (with population decreases, for example)

- revenue-earning slaves may revolt (exodus out of Athens)

- mine exploitation was common for Athenian elites and these mines may lose their productivity or be lost (e.g. war or earthquake)[4]

- products of a particular workshop (run by an elite's slaves) may fail to be successful

- poor moneylending practices and uninsured banking deposits may falter

- political conflict often lead to large fines

- special taxation and liturgies may drain a family's resources

- inappropriate lavishness by a family member.

[4] "I should be most happy to see myself enjoying the material prosperity which was mine before, but since, partly through having to share in the misfortunes common to all those who engage in mining works, and partly through having met heavy reverses in my private business, I have lost my estate" (Demosthenes, XLII, *Against Phaenippus*, line 3).

Millett (1991) uses this evidence to argue that the high degree of impermanence among families making up the liturgical class may be explained by the practical problems involved in repaying nonproductive loans (e.g. dowries and funerals) out of inadequate estates. He further argues that the democracy of Athens allowed for a man of limited wealth to continue to play an active role in the political process.

Evidence of Athenians' views on the instability of wealth arises in preserved writings. The quote from *The Republic* previously given illustrates the desire of the rich man, Cephalus, to maintain the wealth level provided by his ancestors so that his offspring can enjoy the same status he enjoyed. As another example, Lysias in *Against Epicrates and His Fellow Envoys* argues against the men pointing out that they advanced themselves from poverty to wealth while others were faltering. Previously, he argued, they were unable to support themselves, but now they contribute to the special levies producing dramas and dwelling in great houses (Lysias, XXVII, lines 9-10). Thus, anxiety from the fear of falling upon hard times resulted in backlash against those who were able to improve their status to those of the elite. In Demosthenes' forensic speech *Against Phaenippus* the plaintiff asks for compassion for his financial distress "because to enjoy unbroken prosperity is not wont to be the permanent fortune of any large number of our citizens" (Demosthenes, XLII, line 4).

In the Athenian society status was defined based not on family bloodlines and reputation, but on the wealth level obtained. For example, in Solon's laws of 594 B.C. four levels of citizenship were created. Each level was defined by the amount of grain produced in a year, which is obtained using land and

slave labor. Access to public office and privileges were dependent on these classes. Thus, wealth was the determinant of elite status.

Therefore, the thesis of the work presented here is that in the ancient period of Athens the elite experienced significant volatility in wealth. While a man might enjoy the privileges and gains associated with being amongst the elites in a generation there was a significant probability that his offspring would not experience the same quality of life. Status in Athens was dependent on the wealth level obtained and the output produced from that wealth. Such a man is interested in both his level of consumption during his lifetime along with the quality of life of his offspring. Democracy provided an insurance against the unfortunate state. This allows such a man to no longer have to self-insure his offspring by building up his wealth level and, consequently, allows for more consumption. I now turn to a formal model illustrating this effect of democracy on consumption.

4 Model

Let time be discrete and indexed $t = 0, 1, 2, ...$ An agent lives for one time period and at the end of the period has one offspring. Let $c_t \in \Re$ denote the lifetime consumption by the agent who lives in period t. This may include private good consumption, public good consumption, or the consumption of honor, respect, social standing, etc. generated from family, friends, neighbors, or the community. Let $u : \Re \to \Re$ be the utility function. Thus, $u(c_t)$ is the utility derived from the consumption of c_t. This is lifetime utility for the agent and assume u does not depend on t, or rather the offspring has the same utility function as the parent. The agent is altruistic in that he

receives a benefit from the well-being of his offspring. The agent discounts his child's well-being at a constant rate of $\delta \in (0,1)$. Consequently, the total utility derived by an agent is comprised of the utility received during his life and the discounted sum of offsprings' well-being. Define $U(\kappa_t)$ as the total utility where $\kappa_t = \{c_\tau\}_{\tau=t,...,\infty}$. Hence, $U(\kappa_t) = u(c_t) + \delta U(\kappa_{t+1})$, or rather,

$$U(\kappa_t) = \sum_{\tau=t}^{\infty} \delta^{\tau-t} u(c_\tau). \tag{1}$$

Define an agent's wealth as $W_t \in \Re$. Wealth can, obviously, be thought of as monetary resources available to the agent, but may also represent land, buildings, durable capital, and slaves owned by the agent. The monetary resources, slaves, and physical capital allow the agent to increase his and potentially his offspring's consumption. Alternatively, one may think of W_t as social capital possessed that can be used by the agent to improve his utility, which can be expanded upon or denigrated by an individual.

The evolution of wealth is of primary interest here. First, the use of current wealth to improve current consumption diminishes the amount of wealth bequeathed to the agent's offspring. Define β as the portion of consumption that diminishes wealth. Thus, if $\beta = 1$, then the consumption fully deteriorates wealth. For example, land and slaves can be sold to finance an individual's expenditures. Alternatively, if $\beta = 0$, then current consumption has no effect on the level of wealth. For example, one may only consume the fruits of the agricultural land. More generally, consider $\beta \in (0,1]$.

Second, wealth cannot only be used to consume, but may also be productive and grow. Land produces harvests. Transfers from external sources, such as tribute from subject *poleis*, may improve consumption. Similarly, exogenous factors may deteriorate the value of an individual's wealth. In

peaceful times without war or disease an individual's wealth may grow: live-stock herds reproduce and grow, fruits trees which take a substantial time until they produce a harvest may be planted, and new land can be cleared or irrigated. With war, outlawry, or other negative exogenous shocks wealth may be lost. These shocks are primarily transferred to the offspring who take possession of the estate at the death of the parent. In ancient Greece the male controlling the estate/household (*oikos*) is known as the *kyrios*. Inheritance laws left the *oikos* to a son (if one exists) when the father dies (MacDowell, 1978). Consider, then, a shock to the growth rate of wealth. Define γ_t as the exogenous growth rate of wealth where in each period γ is drawn, independently, from the distribution function $F : \left[\underline{\gamma}, \overline{\gamma}\right] \rightarrow [0, 1]$. Assume $-1 < \underline{\gamma} < 0 < \overline{\gamma} < \infty$ with a mean $\widehat{\gamma} > 0$. Thus, $F(\gamma)$ is the probability the growth rate of wealth is less than γ.

Third, taxation may transfer wealth between individuals in the society. Since the objective is to model the provision of democracy, fiscal policy without democracy and with democracy need to be defined. One may rationalize the transfer as each individual preferring both private good consumption and public good consumption. The absolute wealth level of the elite citizens is greater and therefore, their optimal consumption bundle includes more public goods being provided by the government, regardless of the form of government used. Assume that without democracy the elites are able to extract more taxes from the poor to be used to provide public goods than with a democracy. While the poor benefit from the public good, the net effect of the extraction is to reduce their wealth level. The elite who benefit substantially gain from the taxation. A similar framework is developed in

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Fleck and Hanssen (2006). Hence, to model this phenomenon a threshold wealth level, Ω, distinguishes an elite from a non-elite individual. If $W_t \geq \Omega$, then the individual is a member of the elite who benefits from the taxation, while if $W_t < \Omega$, then he is not. This replicates the Athenian conception of status and wealth. In Solon's reforms citizenship status and, hence, access to public goods was determined solely by the quantity of agricultural production. Predetermined output levels distinguished classes of citizens. Let $\tau_g(W_t)$ denote the amount of wealth available after the transfer under a political regime $g \in \{o, d\}$ where o represents an oligarchy and d a democracy. Assume

$$\tau_g(W) = \begin{cases} \eta_g W^\alpha & \text{if } W \geq \Omega \\ \psi_g W^\alpha & \text{if } W < \Omega \end{cases}. \tag{2}$$

Assume $\eta_g > \Omega^{1-\alpha} > \psi_g > 0$ and $\alpha \in (0,1)$. The first guarantees that the wealth of the elite is improved by the transfer, while the nonelite are worse off. The second assumes a diminishing returns to the magnitude of the transfer. Finally, to contrast a democracy with an oligarchy, assume $\eta_o > \eta_d$ and $\psi_o < \psi_d$ so that the magnitude of the transfer is less under democracy. As a consequence, the following timing of events occurs within a generation.

1. The parent leaves his residual wealth to his offspring, R_{t-1}.

2. An exogenous shock to the residual occurs. The result is the wealth of the offspring, $W_t = (1 + \gamma_t) R_{t-1}$.

3. Wealth is transferred from the nonelite to the elite. This leaves $\tau_g(W_t)$ for the individual to use.

4. Consumption occurs and utility is gained.

5. The residual, $R_t = \tau_g(W_t) - \beta c_t$, is left for his heir.

Consequently, the following law of motion for wealth results[5]

$$W_{t+1} = \left(1 + \gamma_{t+1}\right) \left[\tau_g(W_t) - \beta c_t\right]. \tag{3}$$

This is subject to the restriction that $\beta c_t \leq \tau_g(W_t)$. The restriction is equivalent to assuming that there is no borrowing or saving available. Specifically, an individual may freely use financial markets during one's life, but there is no intergenerational borrowing and lending. Any loans taken out must be fully collateralized.

Consequently, an individual's problem is to solve

$$\max_\kappa \quad U(\kappa)$$

subject to

$$W_{t+1} = \left(1 + \gamma_{t+1}\right) \left[\tau_g(W_t) - \beta c_t\right]$$

$$\beta c_t \leq \tau_g(W_t)$$

$$\text{where} \quad \tau_g(W_t) = \begin{cases} \eta_g W_t^\alpha & \text{if } W_t \geq \Omega \\ \psi_g W_t^\alpha & \text{if } W_t < \Omega \end{cases}$$

$$\kappa = \{c_t\}_{t=0}^\infty$$

$$U(\kappa) = \sum_{t=0}^\infty \delta^t u(c_t).$$

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[5]One could, of course, define R as the state variable (instead of W) and define its transition by $R_t = \tau_g\left((1 + \gamma_t) R_{t-1}\right) - \beta c_t$.

5 Optimal Consumption & Bequests

Consider, first, the model where there are no shocks to wealth. This is done to assess the impact of the transfers from the *demos* to the elite on the optimal mix of consumption and savings in an individual's lifetime and on the steady-state levels of consumption and wealth.

5.1 Without Shocks

Let $V(W_t)$ denote the maximum, discounted utility that can be received by the agent if his inherited wealth level is W_t. Furthermore, suppose the growth rate of wealth is known and is equal to $\sigma > 0$; $Prob(\gamma_t = \sigma) = 1$. Hence,

$$V(W_t) = \max_{c_t} \{u(c_t) + \delta V(W_{t+1})\}.\tag{4}$$

Since $W_{t+1} = (1+\sigma)[\tau_g(W_t) - \beta c_t]$ (4) can be rewritten as

$$V(W_t) = u(c_t) + \delta V((1+\sigma)[\tau_g(W_t) - \beta c_t]).\tag{5}$$

To derive an explicit solution to the model assume $u(c) = \ln c$. Furthermore, suppose the value function takes the form $V(W) = \theta_0 \ln W + \theta_1$.[6] Consequently, the optimal consumption level in period t, c_t^*, for an elite solves

$$\frac{1}{c_t^*} = \frac{\beta\delta\theta_0}{\eta_g W_t^\alpha - \beta c_t^*},$$

which simplifies to

$$c_t^* = \frac{\eta_g W_t^\alpha}{\beta(1+\delta\theta_0)}.\tag{6}$$

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[6] Of course, this is a guess at the functional form of the value function. It will be justified that this is valid.

It is straightforward to verify by inserting (6) into (5) and using the functional forms given that

$$\theta_0 = \frac{\alpha}{1 - \alpha\delta}$$

and

$$\theta_1 = \left(\frac{1}{1-\delta}\right)\left(\ln\left(\frac{\eta_g\,(1-\alpha\delta)}{\beta}\right) + \frac{\alpha\delta}{1-\alpha\delta}\ln\left((1+\sigma)\,\eta_g\alpha\delta\right)\right).^7$$

Hence, the optimal consumption for an elite in the society is

$$c_t^e = \frac{(1 - \alpha\delta)\,\eta_g W_t^\alpha}{\beta}. \tag{7}$$

A similar derivation can be done to obtai the optimal consumption for a nonelite, which is

$$c_t^{ne} = \frac{(1 - \alpha\delta)\,\psi_g W_t^\alpha}{\beta}. \tag{8}$$

Additionally, the steady-state level of wealth and consumption can be derived. From (2), (7), and (8) the law of motion for wealth reduces to

$$W_{t+1}^e = \alpha\delta\eta_g W_t^\alpha \tag{9}$$
$$W_{t+1}^{ne} = \alpha\delta\psi_g W_t^\alpha.$$

Define $\widetilde{W} = \ln W$. Thus, for an elite $\widetilde{W}_{t+1}^e = \alpha\widetilde{W}_t^e + \ln\alpha\delta\,(1+\sigma)\,\eta_g$. Notice that $\widetilde{W}_{t+2}^e - \widetilde{W}_{t+1}^e = \alpha\left(\widetilde{W}_{t+1}^e - \widetilde{W}_t^e\right)$ so that, since $\alpha \in (0,1)$, the rate of change in the wealth level is diminishing. Consequently, for a given initial wealth level $\widetilde{W}_0$, $\widetilde{W}_t^e = \alpha^t\widetilde{W}_0 + \sum_{j=0}^{t-1}\alpha^j \ln\alpha\delta\,(1+\sigma)\,\eta_g$.Hence, $\lim_{t\to\infty}\widetilde{W}_t^e = \frac{\ln\alpha\delta(1+\sigma)\eta_g}{1-\alpha}$ so that the steady-state level of wealth, $\overline{W}$, is

$$\overline{W}^e = \left[\alpha\delta\,(1+\sigma)\,\eta_g\right]^{\frac{1}{1-\alpha}}. \tag{10}$$

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[7]This is, as stated, for an elite, θ_1^e. For a nonelite replace η_g with ψ_g to obtain θ_1^{ne}.

Figure 1: Consumption Without Shocks
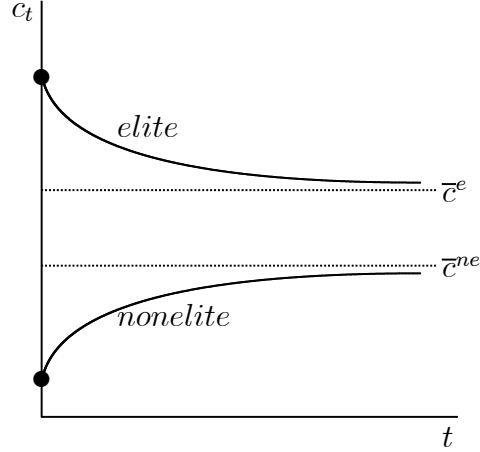
At this steady-state wealth level it follows from (8) that the steady-state level of consumption, $\bar{c}$, is

$$\bar{c}^e = \frac{(1 - \alpha\delta)\,\eta_g \left[\alpha\delta\,(1 + \sigma)\,\eta_g\right]^{\frac{\alpha}{1-\alpha}}}{\beta}. \tag{11}$$

Similarly, the steady-state level of wealth and consumption for the nonelite is

$$\overline{W}^{ne} = \left[\alpha\delta\,(1 + \sigma)\,\psi_g\right]^{\frac{1}{1-\alpha}}$$

$$\bar{c}^{ne} = \frac{(1 - \alpha\delta)\,\psi_g \left[\alpha\delta\,(1 + \sigma)\,\psi_g\right]^{\frac{\alpha}{1-\alpha}}}{\beta}.$$

Figure 1 depicts the evolution of consumption over the generations for a family with a high initial wealth and a family with a low initial wealth if there are no shocks.

A number of results arise. First, regardless of the initial wealth level the

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consumption level of all elites converges to a common steady-state level.[8] Similarly, the optimal lifetime consumption of the nonelites converge to a common amount. Second, an increase in the weight a parent puts on his offspring's well-being decreases the amount one consumes for a given level of wealth. Thus, a greater proportion of wealth is saved. As a consequence, the steady-state level of consumption increases due to the built up stock of wealth. Third, an increase in consumption's deterioration of wealth decreases both the optimal and steady-state levels of consumption. Finally, democracy results in a lower level of both optimal consumption and steady-state consumption for every elite, while democracy improves both lifetime and steady-state levels of consumption for all nonelite.

With regards to the steady-state wealth level, an increase in the weight an individual places on his offspring increases the steady-state wealth level as also evidenced from the expanded steady-state consumption. If a parent cares more about the quality of life of his child, then in the long-run a greater stock of wealth is built up. This is true for elite as well as nonelite citizens. Finally, an important observation is that democracy results in a lower steady-state level of wealth for the elite of a society and a higher steady-state level of wealth for the nonelite. Figure 2 depicts the evolution of wealth for citizens with different initial values.

To make sense of the analysis it must be that the wealth threshold differentiating the elite and nonelite individuals is between the steady-state wealth levels of the two groups, $\overline{W}^e > \Omega > \overline{W}^{ne}$. If not, then in the long run all individuals would be elites or all would be nonelites. Also, notice that the

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[8]This is, of course, under the assumption that all agents have identical preferences and differ only in their initial wealth endowment and, hence, status.

Figure 2: Wealth Without Shocks
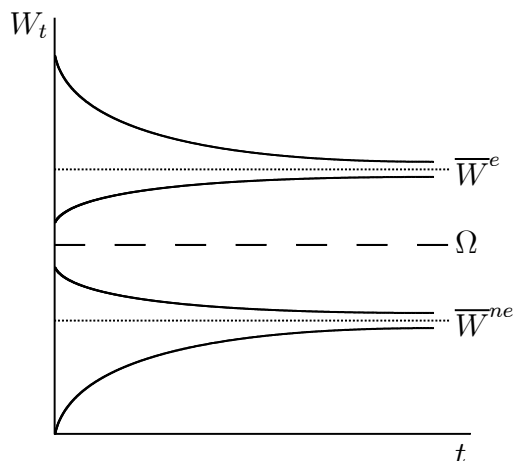
steady-state wealth level is independent of the threshold used. The elite do not necessarily improve their consumption by making the requirements to be part of the elite more difficult.[9] Increasing Ω to be closer to $\overline{W}^e$ acts simply to decrease the number of families that are in the ranks of the elite.

Transfers insert a wedge between the steady-state levels of consumption and wealth. Democracy decreases the size of this wedge reducing the well-being of the elite and improving the well-being of the nonelite.[10] It is clear, then, that the *demos* is interested in democracy, but it is yet unclear why the elite would be interested in providing this power.

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[9]This arises under the assumption that η_g and ψ_g don't respond to the magnitude of Ω. The values of Ω, η_g, ψ_g, and α are taken as exogenous and not modeled here.

[10]Since $V(W) = \theta_0 \ln W + \theta_1$ and θ_1^e and θ_1^{ne} are increasing in η_g and ψ_g respectively, democracy improves the nonelite's value, but decreases the elite's value.

5.2 With Shocks

If there is a positive probability that an individual's offspring changes status, either dropping from the elite to the nonelite or rising from the nonelite to the elite, then optimal consumption may depend on both current status and the probability that one's offspring experiences such a shift. Define $V^e(W)$ as the maximum, expected, discounted value to being an elite if wealth is W. Similarly, define $V^{ne}(W)$ as the maximum, expected, discounted value to being an nonelite when wealth is W.

Consider the decisions of an elite. Define $\tilde{\gamma}$ as the value of γ_{t+1} that sets $W_{t+1} = \Omega$. It follows from (2) and (3) that

$$\tilde{\gamma} = \frac{\Omega}{\eta_g W_t^\alpha - \beta c_t} - 1. \tag{12}$$

The threshold $\tilde{\gamma}$ may be either positive or negative depending on one's wealth level and current consumption. Hence, if $\gamma_t > \tilde{\gamma}$, then one's offspring will continue to be a member of the elite. Consequently, $F(\tilde{\gamma})$ is the probability the heir will not be an elite, while $1 - F(\tilde{\gamma})$ is the probability he will be one. Thus, $V(W_t) =$

$$\max_{c_t} \left\{ u(c_t) + \delta \left[\int_{\gamma=\underline{\gamma}}^{\tilde{\gamma}} V^{ne}(W_{t+1}) \, dF(\gamma) + \int_{\gamma=\tilde{\gamma}}^{\overline{\gamma}} V^e(W_{t+1}) \, dF(\gamma) \right] \right\} \tag{13}$$

The differentiation of (13) is not instructive and is in the Appendix. The optimal consumption is the c_t^* that solves

$$\frac{1}{c_t^*} = AF(\tilde{\gamma}^*) + B\left[1 - F(\tilde{\gamma}^*)\right] - Cf(\tilde{\gamma}^*) \tag{14}$$

where $\tilde{\gamma}^*$ is derived from (12) with $c_t = c_t^*$. As stated, the derivation of A, B, and C are given in the Appendix. Intuitively, though, A is the marginal

cost of additional consumption on the agent's offspring's lifetime utility if he falls out of the ranks of the elites and B is the marginal cost if he remains an elite. C captures the change in the expected value for the marginal agents whose status switches.

What effect does a change in the form of government have on the optimal amount of consumption? The implementation of democracy affects the amount of consumable wealth after the transfer from the poor to the elite. There are multiple effects to consider. First, if the nonelite do not have their wealth extracted at as high of a rate, then more of their ancestors' wealth is available to consume. In the theoretical model, this can be thought of as an increase in $\tau(W_t)$ from $\psi_o W_t^\alpha$ to $\psi_d W_t^\alpha$. Thus, for an elite this increase improves the quality of life of his offspring if they fall from the status of the elite. Being more secure in the well-being of his offspring, an elite need not bequeath as much to his heir. Instead, he increases current lifetime consumption. Proposition 1 provides the formal statement of this result. The results are presented using a simplifying assumption. Namely, for values of γ near $\widetilde{\gamma}^*$ assume $F(\gamma)$ is relatively flat. Specifically, assume $f(\gamma) \approx 0$ for $\gamma \in [\gamma_L, \gamma_H]$ where $\widetilde{\gamma}^*$ is within the interval.

Proposition 1 *If* $W_t < \widehat{W} \equiv \left(\frac{(1-\alpha\delta)\Omega}{\alpha\eta} \right)^{\frac{1}{\alpha}}$, *then* c_t^e *is greater with the transfer* ψ_d *than with* ψ_o.

The proof is in the Appendix. The sufficient condition that $W_t < \widehat{W}$ stipulates that the wealth level of the individual of elite status is not too great. While not necessary this condition guarantees that the improvement in the heir's well-being in the event of a a significant adverse shock to wealth is substantial enough.

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Second, democracy directly affects the amount of wealth an elite has at his disposal to consume. If consumption is maintained at the same rate under democracy as under oligarchy, then less is inherited by the offspring and, hence, the likelihood that the offspring is among the class of nonelites is greater. Furthermore, a decrease in the transfer from the nonelite to the elite decreases the marginal cost of current consumption (lost utility to one's offspring) if his heir falls to the status of a nonelite, but increases the marginal cost if his offspring remains an elite. Hence, if the probability the former arises is sufficiently great and the probability of the former is not too large, then the transition from an oligarchy to a democracy may actually improve the amount an elite consumes.

Proposition 2 *Suppose $W_t < \widehat{W}$. If, for a given level of wealth the distribution function F satisfies $\frac{F(\widetilde{\gamma}^*)}{1-F(\widetilde{\gamma}^*)} > Z$ for a set threshold Z, then c_t^e is greater with the transfer η_d than with η_o.*

The proof of the proposition and, specifically, the derivation of the threshold Z is given in the Appendix. Intuitively, though, if the probability of falling to the status of a nonelite is sufficiently great relative to the probability of staying an elite, then under an oligarchy the elite must save a significant proportion of their wealth to leave to their children. This high level of savings acts as an insurance for one's offspring. In other words, the elite must partially self-insure against the negative intergenerational shock to wealth. Democracy, on the other hand, improves the quality of life of one's offspring in the event that he is not among the class of elite. Democracy, providing this insurance, allows the elite to increase their current, lifetime

consumption. The threshold condition, Z, is the relative marginal costs of consumption on the offspring's well-being. If the likelihood of losing status is substantial and the marginal cost to the nonelite heir's lifetime utility is great, then democracy may be preferred to the elite as well as the nonelite in society.

6   The Choice to Provide Democracy

The objective of the formal model is to show that there exist environments where the origination of democracy increases the consumption of citizens of an elite class. Given that this result has been established, it may be asked whether the elite would be interested in extending the franchise.

For both an increase in the consumable wealth of a nonelite and a decrease in the consumable wealth of an elite, democracy is shown to increase the proportion of wealth that is consumed. Thus, initially, consumption increases. A consequence of this, though, is that the absolute level of wealth held by future generations decreases. Thus, the (expected) steady-state level of wealth and, hence, consumption decreases. The ultimate value of democracy to an altruistic elite depends on the magnitude of the increase in consumption in the short-run, the magnitude of the decrease in consumption in the long-run, and the degree of altruism (the weight placed on utility derived by future generations). What affects this tradeoff and can explain the elite's willingness to extend the franchise?

It can be argued that those elite with the lowest levels of wealth are likely affected more by the provision of democracy. One reason for this is that since they consume lower amounts, the marginal utility of current life-

time consumption is greater. The steady-state level of wealth is independent of the initial wealth level (conditional on it exceeding the threshold necessary to belong in the high class). Thus, the increase in consumption due to democracy has a more significant impact on the value and, hence, democracy is more agreeable.

A second reason is that the elite with lower levels of wealth are more likely to experience an adverse shock that results in their offspring falling to the lower status. Thus, the positive benefit of democracy to the nonelites weighs more heavily on the value to elite with lower levels of wealth.

Whether or not democracy is provided also depends on the mechanism used to make such a decision. What is interesting to note is that the richest of the elite, even if they are currently uninterested in democracy, converge over time towards the same steady-state level of consumption and wealth as the other elites. Thus, if an elite with a wealth level at the steady state prefers a democracy over an oligarchy, then even if a high supermajority threshold is required to extend the franchise and if in the current period not enough elites are interested in democracy, then there exists a future generation in which (near) unanimous consent of all elites will be reached. Thus, if there is insufficient support for democracy in a generation, a future generation may find such a transformation worthwhile.

A few points regarding the model need emphasizing. First, the model assumes the wealth level required to be an elite is exogenous. Thus, the model is better thought of as one where shocks to wealth are idiosyncratic rather than aggregate shocks. With idiosyncratic shocks the wealth level required to be an elite can remain fixed while families oscillate above and

below the threshold. Furthermore, the optimal consumption plan derived in the previous section assumes that the current political regime is permanent. Therefore, the decision to implement democracy is a one-time-only, irreversible decision. As Acemoglu and Robinson (2001) illustrate the ability for the elite to stage a coup to remove the democracy has important implications on the decision to provide it in the first place. One may think of the exogenous shocks to wealth as capturing the possibility of revolutions and coups in the future destroying one's wealth.

7 Conclusion

The objective of the work presented here is to provide another explanation for the origination of democracy. The historical emphasis is on the creation of democracy in ancient Athens. A number of cleaver, well-reasoned theories exist for the extension of the franchise, but it is unclear whether they fully explain the initial creation of democracy. Given the evidence presented of significant volatility in wealth across the generations a model is presented where an elite faces a tradeoff when determining his optimal lifetime consumption: consumption in his lifetime improves his well-being but reduces the amount he can bequeath to his heir (whom he cares about). With exogenous shocks to this transfer of wealth the possibility exists that his offspring will fall from the ranks of the elite. Thus, increased consumption also increases the probability of the unfortunate state befalling his offspring. Under an oligarchic regime the elite extract more than under a democracy and, hence, democracy provides insurance for one's heir. It is shown that there exist environments under which an elite's consumption is higher with this insurance. It is argued,

then, that an elite may prefer democracy to oligarchy. Thus, in addition to class conflict, conflict between the elite, and internal incentives for democracy, the extension of the franchise can be motivated by insurance across the generations.

While the theory presented focuses on explaining the origin of democracy in Athens one would be remiss not to attempt to explain the nonprovision of it in the other Greek *poleis*. Unfortunately, little evidence exists of the economic structure and political organization of others. Sparta was organized into a dyarchy with two kings, one from each of the two prominent families and a council of elite. They transformed their society to actively suppress the nonelite *helots* and *perioikoi*. Hence, they were able to ensure a steady supply of consumption goods and elite status. Mechanisms, then, could potentially be employed to stabilize wealth while maintaining nondemocracy. There were no formal insurance markets in ancient Greece, but it is unclear why the Athenian elite were unable or unwilling to develop an alternative mechanism to protect their offspring.

Additionally, the ancient and classical periods in Athens can be characterized by significant economic growth and development. With the opening of new markets, international trade, and investment activity exposure to risk increased. Other greek *poleis* with relatively more closed economies were not exposed to the degree of volatility in wealth. At least not idiosyncratic shocks to wealth. Thus, the origination of democracy in Athens and its non-origination in other *poleis* can be explained by economic growth. Thus, economic growth may, in fact, be the catalyst for democratic reforms. This effect has been emphasized in a different environment by Ellis and Fender

(2009) and evidence of it is presented by Barro (1999).

Finally, it is worthwhile to point out that the results presented hold if the gap between the post-transfer wealth of an elite and a nonelite near Ω is not great. If η_d is close to ψ_d in value, then the well-being of an offspring of an elite need not reduce that significantly in one generation. In other words, the results of the model do not require radical shocks to wealth which leave an elite's heir destitute. Modest adverse shocks lead to a path over the generations of reduced consumption and wealth.

The framework presented can be extended upon. A formal voting game can be included in the analysis to address how the mechanism used by the elite to determine the extension of the franchise affects its success. Furthermore, this voting mechanism could be formally introduced in the consumption model to more thoroughly develop the origination of democracy. Finally, the transfer from the nonelite to the elite and the threshold differentiating the two classes are taken as exogenous. One may want to investigate how the manipulation of these two variables by the elite affect the provision of democracy. This, though, is left for future consideration. Furthermore, simulations of the economic environment may be done to better identify the range of environments in which democracy not only improves lifetime consumption, but also the value to an altruistic elite over the generations.

8   Appendix

The first objective of the Appendix is to derive the optimal consumption for an individual in the presence of exogenous shocks to wealth. An elite has a

Bellman Equation of

$$V^e(W_t) = \max_{c_t}\left\{u(c_t) + \delta\int_{\gamma=\underline{\gamma}}^{\widetilde{\gamma}} V^{ne}(W_{t+1})\,dF(\gamma) + \delta\int_{\gamma=\widetilde{\gamma}}^{\overline{\gamma}} V^e(W_{t+1})\,dF(\gamma)\right\}.$$

Using the verified functional form for V this is equivalent to

$$= \max_{c_t}\left\{\ln c_t + \delta\int_{\underline{\gamma}}^{\widetilde{\gamma}}\left[\theta_0\ln(W_{t+1}) + \theta_1^{ne}\right]dF(\gamma) + \delta\int_{\widetilde{\gamma}}^{\overline{\gamma}}\left[\theta_0\ln(W_{t+1}) + \theta_1^e\right]dF(\gamma)\right\}$$

where θ_0, θ_1^e, and θ_1^{ne} are given in the text. Inserting the law of motion for wealth, an individual is interested in selecting the c_t to maximize

$$\ln c_t \tag{A1}$$
$$+\delta\int_{\underline{\gamma}}^{\widetilde{\gamma}}\left[\theta_0\ln\left((1+\gamma)\left[\eta_g W_t^\alpha - \beta c_t\right]\right) + \theta_1^{ne}\right]dF(\gamma)$$
$$+\delta\int_{\widetilde{\gamma}}^{\overline{\gamma}}\left[\theta_0\ln\left((1+\gamma)\left[\eta_g W_t^\alpha - \beta c_t\right]\right) + \theta_1^e\right]dF(\gamma).$$

To differentiate this consider, first, the first integral in (A1):

$$\frac{d}{dc}\left(\delta\int_{\underline{\gamma}}^{\widetilde{\gamma}}\left[\theta_0\ln\left((1+\gamma)\left[\eta_g W_t^\alpha - \beta c_t\right]\right) + \theta_1^{ne}\right]f(\gamma)\,d\gamma\right)$$
$$= \frac{d}{dc}\left(\delta\int_{\underline{\gamma}}^{\widetilde{\gamma}}\left[\theta_0\ln\left((1+\gamma)\left[\eta_g W_t^\alpha - \beta c_t\right]\right) + \theta_1^{ne}\right]d\gamma\int_{\underline{\gamma}}^{\widetilde{\gamma}}f(\gamma)\,d\gamma\right)$$
$$= f(\widetilde{\gamma})\frac{d\widetilde{\gamma}}{dc}\delta\int_{\underline{\gamma}}^{\widetilde{\gamma}}\left[\theta_0\ln\left((1+\gamma)\left[\eta_g W_t^\alpha - \beta c_t\right]\right) + \theta_1^{ne}\right]d\gamma - F(\widetilde{\gamma})A$$

where $\frac{d\widetilde{\gamma}}{dc} = \frac{\beta\Omega}{\left[\eta_g W_t^\alpha - \beta c_t\right]^2} > 0$ and, using the definition of $\widetilde{\gamma}$ from (12) $A =$

$$= \delta\left[\theta_0\ln\left((1+\underline{\gamma})\left[\eta_g W_t^\alpha - \beta c_t\right]\right) + \theta_1^{ne}\right]\left(\frac{\beta\theta_0}{\eta_g W_t^\alpha - \beta c_t}\right) \tag{A2}$$
$$-\delta\left[\theta_0\ln\Omega + \theta_1^{ne}\right]\left(\frac{\beta\Omega}{\left[\eta_g W_t^\alpha - \beta c_t\right]^2}\right).$$

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Now consider the second integral in (A1).

$$\frac{d}{dc}\left(\delta\int_{\tilde{\gamma}}^{\overline{\gamma}}\left[\theta_0\ln\left((1+\gamma)\left[\eta_g W_t^\alpha-\beta c_t\right]\right)+\theta_1^e\right]f\left(\gamma\right)d\gamma\right)$$

$$=\frac{d}{dc}\left(\delta\int_{\tilde{\gamma}}^{\overline{\gamma}}\left[\theta_0\ln\left((1+\gamma)\left[\eta_g W_t^\alpha-\beta c_t\right]\right)+\theta_1^e\right]d\gamma\int_{\tilde{\gamma}}^{\overline{\gamma}}f\left(\gamma\right)d\gamma\right)$$

$$=f\left(\tilde{\gamma}\right)\frac{d\tilde{\gamma}}{dc}\delta\int_{\tilde{\gamma}}^{\overline{\gamma}}\left[\theta_0\ln\left((1+\gamma)\left[\eta_g W_t^\alpha-\beta c_t\right]\right)+\theta_1^e\right]d\gamma-\left[1-F\left(\tilde{\gamma}\right)\right]B$$

where $B=$

$$=\delta\left[\theta_0\ln\left((1+\overline{\gamma})\left[\eta_g W_t^\alpha-\beta c_t\right]\right)+\theta_1^e\right]\left(\frac{\beta\theta_0}{\eta_g W_t^\alpha-\beta c_t}\right)$$

$$+\delta\left[\theta_0\ln\Omega+\theta_1^e\right]\left(\frac{d\tilde{\gamma}}{dc}\right).$$

since $(1+\tilde{\gamma})\left[\eta_g W_t^\alpha-\beta c_t\right]=\Omega$. Thus, $B=$

$$=\delta\left[\theta_0\ln\left((1+\overline{\gamma})\left[\eta_g W_t^\alpha-\beta c_t\right]\right)+\theta_1^e\right]\left(\frac{\beta\theta_0}{\eta_g W_t^\alpha-\beta c_t}\right)\qquad\text{(A3)}$$

$$+\delta\left[\theta_0\ln\Omega+\theta_1^e\right]\left(\frac{\beta\Omega}{\left[\eta_g W_t^\alpha-\beta c_t\right]^2}\right).$$

Using (A2) and (A3) the derivative of (A1) is

$$\frac{1}{c_t}+f\left(\tilde{\gamma}\right)\frac{d\tilde{\gamma}}{dc}\delta\int_{\underline{\gamma}}^{\tilde{\gamma}}\left[\theta_0\ln\left((1+\gamma)\left[\eta_g W_t^\alpha-\beta c_t\right]\right)+\theta_1^{ne}\right]d\gamma$$

$$-F\left(\tilde{\gamma}\right)A$$

$$f\left(\tilde{\gamma}\right)\frac{d\tilde{\gamma}}{dc}\delta\int_{\tilde{\gamma}}^{\overline{\gamma}}\left[\theta_0\ln\left((1+\gamma)\left[\eta_g W_t^\alpha-\beta c_t\right]\right)+\theta_1^e\right]d\gamma$$

$$-\left[1-F\left(\tilde{\gamma}\right)\right]B$$

Define the following

$$C=\delta\frac{d\tilde{\gamma}}{dc}\int_{\underline{\gamma}}^{\tilde{\gamma}}\left[\theta_0\ln\left((1+\gamma)\left[\psi_g W_t^\alpha-\beta c_t\right]\right)+\theta_1^{ne}\right]d\gamma\qquad\text{(A4)}$$

$$+\delta\frac{d\tilde{\gamma}}{dc}\int_{\tilde{\gamma}}^{\overline{\gamma}}\left[\theta_0\ln\left((1+\gamma)\left[\eta_g W_t^\alpha-\beta c_t\right]\right)+\theta_1^e\right]d\gamma.$$

Therefore, the optimal consumption can be described by the following expression

$$\frac{1}{c_t^*} = F\left(\tilde{\gamma}^*\right) A + \left[1 - F\left(\tilde{\gamma}^*\right)\right] B - f\left(\tilde{\gamma}^*\right) C \tag{14}$$

where $\tilde{\gamma}^*$ is the value of $\tilde{\gamma}$ such that $c_t = c_t^*$.

Proof of Proposition 1. The optimal consumption, c_t^*, is derived from (14). Let RHS denote the right-hand-side of (14). Consider, then, $\frac{dRHS}{d\psi}$. Since it is assumed that $f\left(\tilde{\gamma}^*\right) \approx 0$, then it follows that $RHS = F\left(\tilde{\gamma}^*\right) A + \left[1 - F\left(\tilde{\gamma}^*\right)\right] B$. Therefore, $\frac{dRHS}{d\psi} = F\left(\tilde{\gamma}^*\right)\frac{dA}{d\psi} - f\left(\tilde{\gamma}^*\right) A\frac{d\tilde{\gamma}^*}{d\psi} + \left[1 - F\left(\tilde{\gamma}^*\right)\right]\frac{dB}{d\psi} - f\left(\tilde{\gamma}^*\right) B\frac{d\tilde{\gamma}^*}{d\psi}$ since $\frac{d\tilde{\gamma}^*}{d\psi} = 0$. This simplifies to

$$\frac{dRHS}{d\psi} = F\left(\tilde{\gamma}^*\right)\frac{dA}{d\psi} + \left[1 - F\left(\tilde{\gamma}^*\right)\right]\frac{dB}{d\psi}.$$

If $\frac{dRHS}{d\psi} < 0$ then the c_t that solves $\frac{1}{c_t} = RHS$ is greater with a higher value of ψ. It follows from (A3) that $\frac{dB}{d\psi} = 0$. Hence, $\frac{dRHS}{d\psi} = F\left(\tilde{\gamma}^*\right)\frac{dA}{d\psi}$. It follows that $\frac{dA}{d\psi} = \frac{\beta\delta}{\left(\eta_g W_t^\alpha - \beta c_t\right)^2}\left[\theta_0\left(\eta_g W_t^\alpha - \beta c_t\right) - \Omega\right]\frac{d\theta_1^{ne}}{d\psi}$. Since $\frac{d\theta_1^{ne}}{d\psi} = \frac{1}{\psi(1-\delta)(1-\alpha\delta)} > 0$ it is required to show that $\theta_0\left(\eta_g W_t^\alpha - \beta c_t\right) < \Omega$ so that, regardless of the selection of c_t, the inequality holds. Thus, if $W_t > \widehat{W} \equiv \left(\frac{\Omega}{\theta_0\eta_g}\right)^{\frac{1}{\alpha}} = \left(\frac{(1-\alpha\delta)\Omega}{\alpha\delta\eta_g}\right)^{\frac{1}{\alpha}}$, then ψ_d generates more consumption for an elite with wealth W_t than does ψ_o (since $\psi_d > \psi_o$). ∎

A couple of intermediate results will prove useful.

Lemma 1 *If* $W_t < 2^{\frac{1}{\alpha}}\widehat{W} (> \widehat{W})$, *then* $\frac{dA}{d\eta} > 0$.

Proof. It follows that $\frac{dA}{d\eta} = \frac{\beta\delta\theta_0^2 W_t^\alpha}{\left(\eta_g W_t^\alpha - \beta c_t\right)^2} - \left(\frac{\beta\delta\theta_0 W_t^\alpha}{\left(\eta_g W_t^\alpha - \beta c_t\right)^2}\right)$ x

$\left[\theta_0\ln\left(\left(1 + \tilde{\gamma}\right)\left[\eta_g W_t^\alpha - \beta c_t\right]\right) + \theta_1^{ne}\right] + \left(\frac{2\beta\delta W_t^\alpha}{\left(\eta_g W_t^\alpha - \beta c_t\right)^3}\right)\left[\theta_0\ln\Omega + \theta_1^{ne}\right]$. Combining, this equals $\frac{\beta\delta\theta_0 W_t^\alpha}{\left(\eta_g W_t^\alpha - \beta c_t\right)^2}$ x

$\left[\theta_0 - \theta_0 \ln\left(\left(1+\underline{\gamma}\right)\left[\eta_g W_t^\alpha - \beta c_t\right]\right) - \theta_1^{ne} + \frac{2\Omega}{\theta_0\left(\eta_g W_t^\alpha - \beta c_t\right)}\left[\theta_0 \ln \Omega + \theta_1^{ne}\right]\right]$. Since $1 + \widetilde{\gamma} = \frac{\Omega}{\eta_g W_t^\alpha - \beta c_t}$ if $\frac{2\Omega}{\theta_0\left(\eta_g W_t^\alpha - \beta c_t\right)} > 1$ then the term in the brackets is positive and $\frac{dA}{d\eta} > 0$. Rather, $2\Omega > \theta_0\left(\eta_g W_t^\alpha - \beta c_t\right)$. It is sufficient if $2\Omega > \theta_0 \eta_g W_t^\alpha$ so that $\frac{dA}{d\eta} > 0 \ \forall c_t$. Hence, if $W_t < 2^{\frac{1}{\alpha}}\left(\frac{\Omega}{\theta_0\eta_g}\right)^{\frac{1}{\alpha}} = 2^{\frac{1}{\alpha}}\widehat{W}$, then $\frac{dA}{d\eta} > 0$.

∎

Additionally, it is straightforward to verify that $\frac{dB}{d\eta} =$

$$\frac{\beta\delta\theta_0 W_t^\alpha}{\left(\eta_g W_t^\alpha - \beta c_t\right)^2}$$

$$\text{x} \ \left[\theta_0 - \theta_0 \ln\left(\left(1+\overline{\gamma}\right)\left[\eta_g W_t^\alpha - \beta c_t\right]\right) - \theta_1^e + \frac{2\Omega}{\theta_0\left(\eta_g W_t^\alpha - \beta c_t\right)}\left[\theta_0 \ln \Omega + \theta_1^e\right]\right]$$

$$+ \left(\frac{\beta\delta\left[\theta_0\left(\eta_g W_t^\alpha - \beta c_t\right) + \Omega\right]}{\left(\eta_g W_t^\alpha - \beta c_t\right)^2}\right)\frac{d\theta_1^e}{d\eta_g}.$$

Again, if $W_t < 2^{\frac{1}{\alpha}}\widehat{W}$, then the expression within the bracket is negative. If $\frac{dB}{d\eta} > 0$, then it is straightforward to verify that transition to democracy increases the consumption of the elite. Instead, suppose $\frac{dB}{d\eta} < 0$. Hence, define

$$Z = \frac{\left|\frac{dB}{d\eta}\right|}{\frac{dA}{d\eta}}.$$

This simplifies to $Z =$

$$\frac{\left|\theta_0 - \theta_0 \ln\left(\left(1+\overline{\gamma}\right)\left[\eta_g W_t^\alpha - \beta c_t\right]\right) - \theta_1^e + \frac{2\Omega}{\theta_0\left(\eta_g W_t^\alpha - \beta c_t\right)}\left[\theta_0 \ln \Omega + \theta_1^e\right]\right|}{\theta_0 - \theta_0 \ln\left(\left(1+\underline{\gamma}\right)\left[\eta_g W_t^\alpha - \beta c_t\right]\right) - \theta_1^{ne} + \frac{2\Omega}{\theta_0\left(\eta_g W_t^\alpha - \beta c_t\right)}\left[\theta_0 \ln \Omega + \theta_1^{ne}\right]}$$

$$+ \frac{\frac{\beta\delta\left[\theta_0\left(\eta_g W_t^\alpha - \beta c_t\right) + \Omega\right]}{\eta(1-\delta)(1-\alpha\delta)\left(\eta_g W_t^\alpha - \beta c_t\right)^2}}{\theta_0 - \theta_0 \ln\left(\left(1+\underline{\gamma}\right)\left[\eta_g W_t^\alpha - \beta c_t\right]\right) - \theta_1^{ne} + \frac{2\Omega}{\theta_0\left(\eta_g W_t^\alpha - \beta c_t\right)}\left[\theta_0 \ln \Omega + \theta_1^{ne}\right]}.$$

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Proof of Proposition 2.   Again, the optimal consumption is derived from (14). Consider, then, $\frac{dRHS}{d\eta}$. Since it is assumed that $f\left(\widetilde{\gamma}^{*}\right) \approx 0$, then

$$\frac{dRHS}{d\eta} = F\left(\widetilde{\gamma}^{*}\right)\frac{dA}{d\eta} + \left[1 - F\left(\widetilde{\gamma}^{*}\right)\right]\frac{dB}{d\eta}.$$

If $\frac{dRHS}{d\eta} > 0$ then the c_t that solves $\frac{1}{c_t} = RHS$ is less with a higher value of η. Thus, if $\frac{F\left(\widetilde{\gamma}^{*}\right)}{1 - F\left(\widetilde{\gamma}^{*}\right)} > Z$, then $\frac{F\left(\widetilde{\gamma}^{*}\right)}{1 - F\left(\widetilde{\gamma}^{*}\right)} > \frac{\left|\frac{dB}{d\eta}\right|}{\frac{dA}{d\eta}}$ so that $F\left(\widetilde{\gamma}^{*}\right)\frac{dA}{d\eta} > \left[1 - F\left(\widetilde{\gamma}^{*}\right)\right]\left|\frac{dB}{d\eta}\right|$ and $F\left(\widetilde{\gamma}^{*}\right)\frac{dA}{d\eta} + \left[1 - F\left(\widetilde{\gamma}^{*}\right)\right]\frac{dB}{d\eta} > 0.$ ∎

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