Status in a canonical macro model: labour supply, growth, and inequality

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Abstract

We introduce status in the most standard (canonical) macro model that is able to provide an analysis of growth and distribution. We consider the question of whether status considerations enable the model to meet some important empirical findings (which we review) related to rising labour supply (the work-life balance), rising income inequality, and changing factor shares. We find a promising role for status in the explanation of these empirical regularities.

Keywords: Status, growth, inequality, labour supply, social/behavioural macroeconomics

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Introduction

The status-seeking, or keeping up with the Joneses, motive has received considerable attention in the literature on consumers' behaviour in recent years. It is the idea that what motivates consumers is not only appreciation of individual consumption *per se*, but also their relative position with respect to the others' level of consumption, possible underlying causes being ambition, envy, greed or a sense of achievement, status and identity or similar powerful motives of human behaviour.[i] In macroeconomics, such arguments seem to be gaining ground. Among the examples is Ljungqvist and Uhlig (2000) which investigates the effects of this specification for tax policy; Jung (2004) which investigates business cycle dynamics under this feature and sticky prices; and Dixon (2000), which shows that aspiring to earn the long-run rate of profit (a form of keeping up with the Joneses) is likely to lead to collusion as the only viable strategy. Along with the evolution of (endogenous) habits, social comparisons and status-seeking in utility may be among the primary explanations of the Easterlin paradox whereby happiness increases only sluggishly in the face of big increases in income (see e.g. Easterlin, 2001; Clark *et al*., 2008). Closer to the aims of this paper, implications for growth have been highlighted, among others, by Futagami and Shibata (1998), Corneo and Jeanne (1997, 2001), Carroll, Overland and Weil (1997), Tournemaine (2008), Tournemaine and Tsoukis (2008). Alonso-Carrera, Caballé and Raurich (2004) and Alvarez-Cuadrado, Monteiro and Turnovsky (2004) draw implications for macroeconomic dynamics.[ii]

As the wide-ranging reviews of Frey and Stutzer (2002, p. 411-2) and Clark *et al*. (2008, sub-Sections 1, 3.1 and 3.2) show, the concern over social comparisons in individual decision making is a long-established line of inquiry, indeed a conclusion, across a variety of social disciplines and sub-disciplines, including economics and happiness-related research. More specifically, evidence of relative income and status in the utility (or happiness function) appears in social psychology, neurological and physiological studies, and experimental economics. In social psychology, where such concerns date to at least as far back as Festinger (1954), such concerns are obvious in the textbook expositions of Brewer and Crano (1994, Chapter 11) and Aronson *et al*. (1994, Chapter 9). In economics, the idea of status and social comparisons in income in utility function also go back quite a long way. A variety of studies reported in Clark *et al* (2008, section 3.2) have related subjective (self-reported) measure of happiness to absolute and relative income. They show a fairly strong negative influence of comparison income on happiness, on occasion to the point that individual income enters only via the relative income regressor and not independently (as absolute income).[iii]

Sampling among relatively recent literature, we may note Clark and Oswald (1996) which concludes that workers' job satisfaction are negatively related to their comparison earnings levels. Ferrer-i-Carbonell (2005), Maurer and Meier (2008), McBride (2001) and Senik (2007) all confirm the importance of reference income as a determinant of subjective measure of well-being, or happiness. So, one cannot but conclude with Frey and Stutzer (2002), p. 412: There is little doubt that people compare themselves to other people and do not use absolute judgements.[iv, v] But of course, many details need to be filled by empirical work. As Frey and Stutzer themselves go on to note, it is crucial to know with what other people such a comparison is being made (see e.g. Senik, 2007). Furthermore, there is rather little concrete empirical information on the exact magnitudes of elasticities, the curvature of the status sub-utility, and about the effect of distribution on happiness and fairness considerations (see Kahneman *et al*., 1986). We shall come back to the last two of these points below.[vi]

The notion of status-seeking, or social comparisons in utility, may be appealing as a possible explanation of a number of recent findings in macroeconomics. As documented in some detail in Section 2 below, recent research has provided evidence of rising income inequality in some industrial economies, notably the US, shifting balance in the labour and capital income shares, and differing across the Atlantic, but also increasing, labour supply. Keeping up and status motives may potentially go some way towards providing an answer as they alter the

motives and therefore the behaviour of individuals. For instance, higher such incentives may motivate individuals to work harder. By being the source of heterogeneity, and by interacting with other sources of heterogeneity, such motives may thereby alter income distribution. Furthermore, by changing the supply of labour and thereby the productivity of capital, such behaviour may also have implications for factor shares. There do not generally seem to exist widely accepted explanations for the stylised facts mentioned above. So, the addition of cultural and behavioural elements like status motives (paralleling the cultural differences across the Atlantic proposed by Blanchard, 2004) into the list of (not necessarily mutually exclusive) possible causes and their analysis is worthwhile.

Accordingly, this paper has a twofold aim: Firstly, to review in some detail recent evidence on income inequality, labour supply and factor shares in industrialised economies. Arguably, there is now a set of stylised facts that must be considered by, and inform, macroeconomic research. The second aim is to incorporate status-seeking into a standard macro model and obtain a number of (what can be called) stylised predictions, i.e. some key effects of such a motive. This canonical model (to use the label, and a variant of the model, introduced by Garcia-Penalosa and Turnovsky, 2005) features a basic model of endogenous growth coupled with agent heterogeneity and hence distributional considerations. While growth has long been recognised as a key feature of the macroeconomy, particularly when cross-country comparisons are involved, the literature mentioned above makes the big point that distribution should also be a second key feature.[vii] While admittedly very schematic, such a canonical model can potentially be a useful organising framework for the understanding of the seemingly disparate reported empirical observations. It can also form the basis from which such status considerations can be introduced into more complex and realistic models. Therefore, our particular aim is to provide a qualitative initial analysis of the question, to what extent can the model's stylised predictions go in meeting the reported stylised findings? The idea here is to see whether cross-country or inter-temporal variations in the status motive can potentially deliver the observed patterns in the variables in question. For a better perspective, other potential factors such as productivity differences, monopoly power arising from labour market imperfections or taxes are also included and their effects compared to those of the status-seeking motive. Thus, the added value of this paper is to re-affirm the importance of issues hitherto rather peripheral to main macroeconomic research, and to introduce status into a standard macro model as an organising framework and working hypothesis to understand them. It must be emphasised that the conclusions are qualitative, as the paper is rather exploratory in nature.

While the literature so far has by and large considered a standard specification for keeping up with the Joneses, social comparisons in consumption, or status motives (we use the terms interchangeably, with more emphasis on the last one), some previous work, including our own, has highlighted the fact that there is a variety of arguments to consider and avenues to pursue in formalisation. For instance, Tsoukis (2007) and Bilancini and Boncinelli (2008) show the non-equivalence of mean- versus rank-based social comparisons. Tournemaine and Tsoukis (2010) introduce the average versus differential status effects distinction and also introduce heterogeneity among agents in the status motive. These arguments are briefly reviewed below (sub-Section 3.1) before being introduced into the model. But a key point is that, in the absence of much guidance from empirical work, one should keep an open mind in considering these effects.

The paper is structured as follows: Section 2 reviews the relevant findings mentioned above in more detail. Section 3 introduces status into the basic model and derives the basic optimality conditions. Section 4 analyses a core model in the steady state (the focal point of the paper), while Section 5 derives further results. Section 6 concludes.

1. Some stylised facts in social/behavioural macroeconomics

This Section briefly reviews various themes in macroeconomics of a broad social concern, together with some relevant evidence.

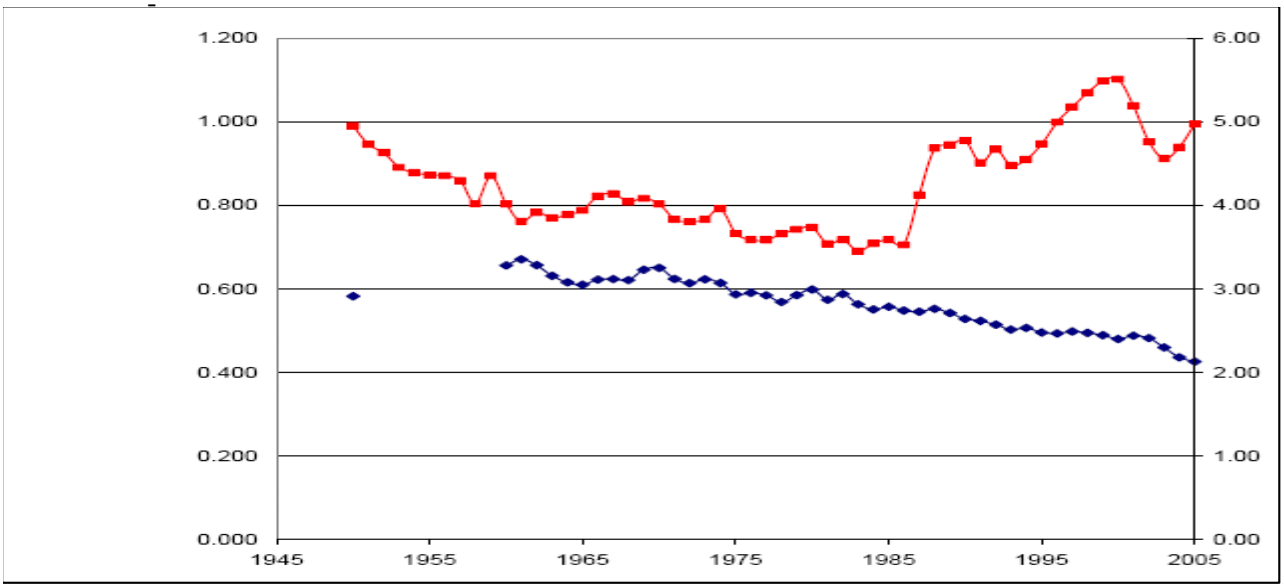
2.1: Income distribution

Piketty and Saez (2006) provide some very interesting information on income inequality in the US. The broad picture seems to be that inequality fell in the first few decades after WWII from its high pre-war levels (what has been termed the great compression, see Krugman, 2007, for references and discussion), but seems to be rising lately. There is a fractal quality in the increase in inequality (a term that is also due to Krugman) in that the higher individuals are in the distribution, the more their income has increased: The income share of the top decile in US fell from about 45% pre-war to about 32% during 1940-85. It shows an increasing tendency post-85 (about 40% in 2000). The income share of top 1% incomes was about 8% in the 1960s and 70s, but about 15% in 2000. (However, the top 1% wealth share seems constant, if not declining.) The top 0.1% income share was about 7% in 2000, up from 2% 30 years earlier. These tendencies in the US are mirrored by the UK and Canada, but not continental Europe or Japan, (e.g. in the behaviour of top 0.1% income share, which appears more stable).

The same picture is corroborated by the data and historical analysis for the US presented in Levy and Temin (2007). Their Figure 1, replicated below, shows (square line – left scale) the ratio of annual earnings (including fringe benefits) of the median worker divided by a standard labor productivity measure – roughly speaking, a measure of the (marginal) share of total output per worker that the median full-time worker captures in compensation. The diamond line, below, (right scale) shows the Piketty-Saez (2003) estimate of the 99.5th income percentile on federal tax returns – the median income of the top 1 percent of reported incomes. The almost continuous, but accelerated from about 1980, decline in median worker incomes is remarkable, together with the startling rise in magnitude of the top incomes at about the same time. A similar picture emerges in Dew-Becker and Gordon (2005), who show (among other things) that the ratio of the top percentiles/deciles of income relative to the 10^{th} decile have increasingly diverged since the 1970s. If we denote by Px the income of the cohort above the lowest x% (starting from the bottom), so that for instance P99 is the income of the 100^{th} (top) percentile, then obviously the following inequalities apply: P99.9/P10>P99/P10>P90/P10, but the distance between these ratios has been continuously rising in the last 25 years– see Figure 7 in Dew-Becker and Gordon (2005).

As the comprehensive survey of Dew-Becker and Gordon (2007) shows, explanations for this rise in inequality vary, from attribution to globalisation and immigration, to skills-biased technical progress (see Autor *et al.*, 2006), to a shift in institutions such as policies and the more general political climate that has changed considerably in the US since about 1980 (Levy and Temin, 2007; echoed in more public discourse, e.g. Krugman, 2007). In particular, the skills-biased technical progress thesis, so prominent a few years ago, has now receded, partly because there is a lot of highly educated and skilled members of the workforce that have not enjoyed such increases in wages, and partly because the rising wages inequality coincides with a rise in entrepreneurial incomes and the capital share more generally (Levy and Temin, 2007, Appendix; see also Section 2.2. below). But it is fairly safe to say that we are far from a consensus. Shifting attitudes and more broadly social norms, may have played a role in this context. The present paper can be seen as a first step to investigate a subset of such cultural factors, namely the effect of potential differences in status motives.

Figure 1: Alternative measures of income inequality in the US



Replicated from Levy and Temin (2007, Figure 1). Blue line – left scale: The income of the median full-time worker divided by productivity, compiled by Levy and Temin (2007). Red line – right scale is the median income of the top 1% of reported incomes, following Picketty and Saez (2003), and the updated estimates available on Saez' website: http://elsa.berkeley.edu/~saez/

A statistic often used to describe income inequality is the Gini Index; it ranges from 0 (total equality) to 1 (one person owns the entire economy), so that the higher the number, the higher is inequality. Summary data from the OECD for selected industrial countries for the last 30 years or so is shown in Table 2 below: The index seems to have increased but not uniformly; other data from the same source (not shown) shows if anything a broad tendency for the index to increase for most countries. Finally, Krugman (2007, Chapter 7) argues that whilst between 1973 and 2006 there had been a net, usable productivity growth of the order of 35%, the overall fortunes of the typical, median American family were hardly any better at the end of the period compared to the beginning. So, rising income inequality in the last 20 years in some parts at least of the industrialised west, notably in the US, seems to be an emerging fact, even if the precise details are yet to be determined.

Table 1: Gini coefficient – selected countries

	mid-70s	mid-80s	around 1990	mid-90s	around 2000	mid-2000s
France		0.31	0.3	0.28	0.28	0.28
Germany		0.26	0.26	0.27	0.27	0.3
Japan		0.3		0.32	0.34	0.32
United Kingdom	0.28	0.33	0.37	0.35	0.37	0.34
United States	0.32	0.34	0.35	0.36	0.36	0.38

Source: OECD

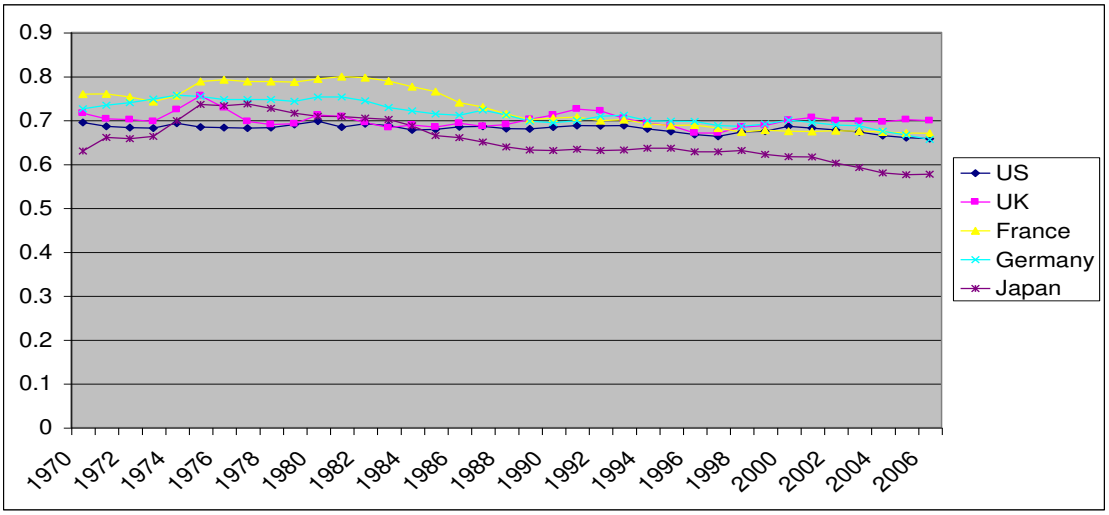
2.2: Factor shares

Interest has also increased on the functional distribution of income, or the determinants of factor shares; an early empirical analysis being Blanchard (1997). Gollin (2002) documents cross-country variation in labour shares, which for most countries the values lie in the range of 0.65-0.80 (data from late 1980s – early 90s). Perhaps in line with generally rising income inequality, there appears to be some evidence of changes in factor shares. OECD data for the same sample of 5 countries is presented in Figure 2 below; it does appear to indicate a slow downward trend in the labour share. Blanchard and Giavazzi (2003) show evidence for France, Germany, Italy and Spain in which the labour share of GDP went from the highs of around 0.67-0.78 around 1980 to about 0.60-0.65 in the late 1990s. However, this conclusion appears to be contested by Dew-Becker and Gordon (2005, p. 73) who note:

> Overall there seems to be little air of crisis in the data on labour's share. Especially when the labor component of proprietors' income is included, the share of labour in domestic income has floated up and down over the decades with no clear trend.

But, their Figure 2 does show something that could be interpreted as a mild downward tendency in the labour share since 1980 from a peak of more than 0.76 to about 0.72 in 2005, though the picture is mixed because the long-run trend (if any) is confounded with movements at other frequencies. In other words, as with the overall inequality mentioned above, we are beginning to see some signs of such trends, but one cannot as yet affirm categorically their precise nature.

Figure 2: Labour shares – selected countries



Source: OECD

2.3: Work-life balance

Another emerging stylised fact is the 24/7 lifestyle, societies that move and work ever faster and harder (Choudhary and Levine, 2006; Hamermesh and Slemrod, 2008).[viii] In this respect, we may note the finding by Alesina *et al.* (2005) that the US is more work-prone than Europe. Specifically, the total hours of work per week per person are for the US 25.13, for France 17.95, for Germany 18.68, and for Italy 16.68. They attribute this considerable difference between the US and Europe to differences in employment regulation and in the rate of unionisation across the two sides of the Atlantic; whereas Prescott (2004) attributes this entirely to differences in the marginal tax rates. Blanchard (2004) attributes these differences to differences in preferences and argues that gains in productivity are more likely to be translated into leisure in Europe than in the US. One thing implied by Blanchard, and verified by the data, is that there is no notable difference in growth rates across the two sides of the

Atlantic. The finding of increasing hours of work, of differences in this respect across the Atlantic, and the lack of difference in terms of growth rates will be key points in our analysis below. They will be seen to have strong implications about the possible differences in exogenous fundamentals that cause such stylised facts.

2.4: The growth-inequality relationship

There is a long-running debate on efficiency versus equity, or growth vs. (in)equality. Aghion, Caroli and García-Peñalosa (1999) present a review of a variety of theoretical arguments. Among more recent contributions, Corneo and Jeanne (2001) and Tournemaine and Tsoukis (2010) find that equality promotes growth, whereas, in an overlapping-generations model with status effects, Hopkins and Kornienko (2006) argue that the relationship depends on the relative pursuit of status by the young and old. To give a flavour of the empirical results, Perotti (1996), and Persson and Tabellini (1994) present cross-country evidence of a negative effect of inequality on growth. In contrast, using a panel of U.S. states, Partridge (1997) concludes that greater inequality is associated with greater growth. Other studies, finally, conclude that changes in income and changes in inequality are unrelated (Deninger and Squire, 1996; Chen and Ravallion, 1997). It is probably fair to say that, as yet, there seems to be little sign of consensus either at theoretical or empirical levels on this relationship. Once again, the role of differences in status-seeking motivation, and of other cultural differences more generally, can be fruitfully analysed.

2.5 Summary: Stylised facts

Even though much more information is required in order for the following to be described fully, and even though they will continue to be re-evaluated along the way, one may argue that we now have enough information to highlight the following three empirical findings and to classify them as stylised facts to be met by the basic macro models:

a) Rising income inequality, probably more so in the US (and the UK) rather in (continental) Europe;
b) A 24/7 work-life balance that produces more labour supply in the US than in Europe, without however the growth differences being correspondingly great;
c) Factor shares that seem to be slowly tilting towards capital.

There seems to be rather little by way of explaining these developments. The argument of this paper is that the status motive may play a key role in shaping these developments, as it induces a greater labour supply, hence it causes growth differences to be exacerbated, and also causes a fall in the marginal product of labour and labour remuneration. The rest of the paper is an exploration into the status motivation alongside some other factors that appear as candidates for explanation.

2. The model

3.1: Technology, preferences and relative standing

We postulate an economy in discrete time that goes from zero to infinity. There is a unit mass [0, 1] of infinitely-lived individuals denoted by i who are also producers. The unit mass allows us to simplify things by equating aggregate and average values. Each individual is initially endowed with $K_{i,0}>0$ units of capital (wealth) at date zero and one unit of labour-time allocated to leisure and working activities. She produces an output, $Y_{i,t}$, which can be consumed, $C_{i,t}$, or invested to give new units of capital, $K_{i,t}$. Each individual benefits from the production technology:

$$Y_{i,t} = A_i K_t^{\lambda} K_{i,t}^{1-\lambda} L_{i,t}^{\lambda} \quad , \ 0<\lambda<1. \tag{1}$$

Apart from private capital, $K_{i,t}$, and labour, $L_{i,t}$, there are two different components of productivity. The first is agent-specific: $A_i>0$ is an index of individual skill, exogenously given. It is assumed that A_i is log-normally distributed across individuals with mean α and variance σ_a^2. Defining $\alpha_i \equiv \log A_i$, we have $\alpha_i \sim N(\alpha, \sigma_a^2)$ in a time-invariant fashion. Second, productivity is promoted by a learning-by-investing externality of aggregate activity, common across agents; this is a standard idea in the endogenous growth literature. As a convenient specification, productivity depends on the per capita (mean) amount of capital, K_t (as in Bertola, 1993). The resulting AK type of technology combines a number of desirable features, namely diminishing returns to private capital, but constant returns to aggregate capital guaranteeing endogenous growth.

Individuals derive utility from their level of consumption, leisure and their social status. Formally, consumer i's instantaneous utility function is:

$$U_{i,t} = \sum_{t=0}^{\infty} \left\{ (1+\rho)^{-t} \left[\log C_{i,t} + \log f(C_{i,t}, \overline{C}_t) - \beta L_{i,t} \right] \right\}, \qquad (2)$$

where ρ is the subjective discount rate (common across agents), $\beta>0$ is a measure of the marginal disutility of work, $L_{i,t}$ is the amount of labour-time allocated to working activities (i.e. output production) and $f(\bullet)$ captures the status motive (or Joneses effect) in consumption. Apart from individual consumption (subscripted i), its level also matters relative to reference consumption taken to be the average in the economy (denoted with over-bar: $\overline{C}_t$). The functional form that such social comparisons should take is not entirely clearcut. Early specifications (Boskin and Sheshinski, 1978; Gali, 1994; Ljungqvist and Uhlig, 2000) suggested that $f(\bullet)$ should depend solely on the distance of individual consumption from the mean.[ix] An increasingly influential strand (e.g., Abel, 1990) suggest considering comparisons in a ratio form. Yet a third, minority, literature (Hopkins and Kornienko, 2004; Corneo and Jeanne, 2001) has argued that it is the *rank* of individuals within the social hierarchy (i.e., the consumption distribution) that matters, whatever the basic underlying motive is. In this light, the distance (in absolute or percentage terms) from the mean does not capture all necessary information, as rank depends also on the nature of the distribution. Here, we follow the second strand and assume the $f(\bullet)$ function to depend on relative consumption, or ratio of individual to reference (here: mean) consumption. To maintain intuition, we shall sometimes refer to $f(\bullet)$ as the relative standing function.

Our main analytical innovation relates to the elasticity of the relative standing function $f(\bullet)$ with respect to the relative standing $X_{i,t}^C \equiv C_{i,t} / \overline{C}_t$. Following Tsoukis (2007), Tournemaine and Tsoukis (2010), we postulate a convenient form of this elasticity, that we denote by $\phi_{i,t}$:

$$\phi_{i,t} \equiv \frac{\partial f(\bullet)}{\partial X_{i,t}^C} \frac{X_{i,t}^C}{f(\bullet)} = \phi_0^i + \phi_1 x_{i,t}^C + \phi_2 Var(x_{i,t}^C). \qquad (3)$$

A number of ideas are incorporated here. Firstly, we have the distinction introduced in Tournemaine and Tsoukis (2010) between average and differential status effects. Average status motivation (ϕ_0^i) is taken to be that portion of the elasticity that does not depend on the relative standing of the agent. In contrast, the differential effect captured by the term $\phi_1 x_{i,t}$

does depend on the relative position of the individual as we define: $x_{i,t}^{C} \equiv \log X_{i,t}^{C}$. Furthermore, there is more to be said about both these parts of the elasticity. The average effect is taken to be agent-specific (via the i-superscript) so as to capture idiosyncratic motivation (e.g., some people are more driven than others because of status considerations). This introduces another source of heterogeneity in the model, in addition to skills heterogeneity. This allows us to capture the idea that agents may be more or less driven either because of genuine ability (skills), or status-related motivation. In reality, these two sources of heterogeneity may be expected to be positively correlated, but a case can be made that they are conceptually distinct, so we will treat them here as orthogonal. For convenience, we assume that ϕ_0^i is normally distributed across individuals with mean ϕ_0 and variance σ_ϕ^2: $\phi_0^i \sim N(\phi_0, \sigma_\phi^2)$).

The differential effect regulates the curvature of the status function, $f(\bullet)$. We may distinguish between convexity of $f(\bullet)$ with respect to relative consumption ($\phi_1>0$); we call this gains from status– status increasing faster than relative position, or it pays to be a leader. Concavity is given by the opposite case, ($\phi_1<0$); we call this pains from loss of status– status being *lost* faster than relative position, or it is painful to lose out. This elasticity will be shown to be important below in the model's ability to qualitatively emulate the stylised facts. Despite this (potential) importance, there is no empirical evidence (to our knowledge) as to what case is more plausible. Clark and Oswald (1998) provide a pioneering (partial-equilibrium) analysis of the importance of this distinction; they show that concavity implies generally a follower's (or conformist's) behaviour, whereas convexity implies a deviant behaviour - the individual enjoys being different; they argue in favour of the concavity case. Perhaps the most compelling argument for signing ϕ_1 is the notion of loss aversion (Tversky and Kahneman, 1991). According to this notion, losses from a reference point are more highly valued than potential gains; hence, assuming that equality is a reference point (i.e. $X_{i,t}^{C}=1$ for any i), moving upwards from it may be less important than moving downwards. Recent empirical evidence that supports the asymmetry of comparisons, like that of Ferrer-i-Carbonell (2005; suggesting that comparisons are mostly made upwards) and Senik (2007; suggesting that unfavourable comparisons are more important than favourable ones), is in line with this hypothesis. All this body of literature, then, suggests that the $f(\bullet)$ function is concave ($\phi_1<0$), a baseline assumption we are going to make.[x]

The term ($\phi_2<1/2$ introduces another effect, namely the effect on status of a greater variance in relative positions, $X_{i,t}^{C}$. There is even less clear evidence on the sign of ϕ_2. We may reason that, in view of the fractal quality of the increasing income inequality (i.e., the increase of incomes in a percentile is greater the higher the percentile), a rise in variance is likely to mean in practice an unfavourable increase of the distance for the vast majority of individuals, so it is likely to demoralise them; in this respect, we should expect $\phi_2\leq 0$. Within this framework, it is interesting to note another difference across the Atlantic reported by Alesina, DiTella and MacCulloch (2004), namely that inequality negatively affects happiness in Europe but not in the US. Variation in ϕ_2 will be seen to affect various outcomes below.[xi]

Thus, the postulated elasticity (3) is rich enough to capture a range of considerations, and broadly in line with the available empirical evidence.[xii] It will play a crucial role in what follows, as our core analytical contribution is to introduce elasticity (3) into the canonical model of growth and distribution and investigate the effects of its various aspects, particularly in relation to the stylised facts reported above. Parameters ϕ_1 and ϕ_2 are common across agents; heterogeneity is generated by idiocyncratic average status motivation (ϕ_0^i) and idiocyncratic productivity, A_i.

Finally, the literature has pointed out a potential effect of growth (g) on relative standing and status via its effect on reference consumption $\overline{C}_t$ (Gali, 1994; Abel, 1990). This may be the current mean, or the past mean. In the latter case, we have a variant assumption termed catching up with the Joneses; the idea is that it takes time for agents to form a clear view of the reference to which they ought to compare themselves. In this case, as consumption grows at the general growth rate in the steady state, the growth rate plays a positive role in enhancing status.[xiii] If so, the differential status effect may be written as $\phi_1=\varphi(g)$, with $\varphi'(g)>0$. In an Appendix, we briefly explore this possibility.

3.2: The representative agent's problem

Individuals choose consumption, capital accumulation and labour devoted to output production that maximise intertemporal utility (2) subject to the technology constraint (1) and the sequence of resource constraints (in beginning-of-period notation and ignoring depreciation) given by:

$$\Delta K_{i,t+1} = (1-\tau)Y_{i,t} - C_{i,t} + T_{i,t}, \qquad (4)$$

where Δ is the difference operator between two periods of time, τ is a flat tax at rate levied and rebated as a lump-sum transfer, $T_{i,t}$. The introduction of this policy will allow us to determine in a clearcut manner which of the status effects or the tax rate replicate better the empirical regularities.

For simplicity, and as it does not alter the behaviour of individuals, we assume that the lump-sum rebate, $T_{i,t}$ is constant across individuals i: $T_{i,t} = T_t$ for all i. Moreover, for reasons that will become clearer below, we assume that the rebate is indexed on average consumption (as opposed to the customary average output). Hence, by the unit mass and equality of aggregates and averages, the lump-sum rebate each individual gets equals a fraction θ (to be definitised below) of average consumption.[xiv] Under the assumption of a balanced government budget constraint, we thus have:

$$\int_i \tau Y_{i,t} di = \int_i T_{i,t} di = T_t = \theta C_t . \qquad (5)$$

Note that the way the tax operates makes it redistributive, but also makes it a distortion without any supporting role for public services. This tax will allow us to consider the Prescott (2004) claim that the differences in labour supply across the Atlantic are due to tax differences; and Levy and Temin (2007) claim that public policy and taxation have affected inequality (for quite obvious reasons) in the US.

The first order conditions of this problem with respect to consumption and capital, may be expressed as:

$$\frac{(1+\phi_{i,t})/C_{i,t}}{(1+\phi_{i,t+1})/C_{i,t+1}} = \frac{1+(1-\tau)(1-\lambda)Y_{i,t}/K_{i,t}}{1+\rho}. \qquad (6)$$

(6) is the Euler equation; it equates the marginal rate of substitution with the marginal rate of transformation in consumption across dates t and t+1. Furthermore, from the first order conditions with respect to consumption and labour, we obtain:

$$\frac{\beta}{(1+\phi_{i,t})/C_{i,t}} = (1-\tau)(1-\mu)\lambda(Y_{i,t}/L_{i,t}) \ , \qquad (7)$$

Equation (7) equates the marginal utility of leisure to its opportunity cost, net of tax. Though the worker and firm are identical here (a yeoman farmer), we introduce a markup term (μ) to capture product market imperfections. Specifically, $\mu \geq 0$ captures the monopolistic power of firms, with $\mu=0$ being the polar case of perfect competition in the product market. Such monopoly power would decrease the real wage in relation to the marginal product of labour. The aim is to evaluate whether imperfections in the product markets, but also more generally their structure and/or regulation, may be responsible for the observed facts, particularly labour shares (Blanchard and Giavazzi, 2003) and/or working hours.[xv] On the other hand, labour market imperfections such as trade unions or labour market regulation are captured by β, not by μ.[xvi] Thus, a rise in monopoly power in favour of the worker (say, via unionisation) would be equivalent, *ceteris paribus*, to a higher disutility of labour (and implicitly the reservation wage) and a higher real wage and marginal product of labour. It is worth noting that the status motive works in the same way as, but in the opposite direction than, both the firm and the worker monopoly power in (7). It will be seen that status seeking is a rich source of shifts in (7), as it is affected by a number of factors (relative position, its variance, and the growth rate), and because it is idiosyncratic.

3. A core system in the steady-state: Growth and labour supply

In this Section, we develop a first core system in the (economy-wide) growth rate and labour, holding the relative position of agent i as exogenous. The aim is to investigate the effects in this model of the key exogenous institutional changes we consider, namely a rise in the status-seeking motive (captured by the elasticity ϕ and the parameters in 3), a rise in the tax rate (τ), in monopoly power (μ), and an exogenous rise in productivity or technology (α).

In the steady state, on which the rest of this paper focuses, all distributions (of consumption, capital, labour and output) are invariant. Thus, for convenience, time subscripts are dropped. Moreover, the consumption and output growth rates (to be indicated by g) are common across farms; if not, somebody would eventually end up owning the whole economy. In this context, in the steady-state, equation (6) reads:

$$1+g = \frac{1+(1-\tau)(1-\lambda)Y_i/K_i}{1+\rho} \ .$$

Log-linearising and approximating in the standard way, we obtain:

$$g = (1-\tau)r - \rho \ , \qquad (8)$$

where r is defined from the Cobb-Douglas technology (1) as:

$$r = (1-\lambda)Y_i/K_i \qquad (9)$$

One point worth noting about the Keynes-Ramsey rule of consumption growth (6) is that ϕ_i is in general time-varying, giving scope for short-run dynamics even in an AK model, a point noted by Alonso–Carrera *et al*. (2004). Alvarez-Cuadrado *et al.* (2004) investigate in detail the dynamics outside the steady state and note that they are driven by a status effect (comparison of individual consumption with $\overline{C}$ in our terminology), as well as the rate of return. In the steady state, however, with time-invariant relative consumption distribution and

growth, our specification (3) yields a constant status elasticity in the steady state, so that steady-state growth (8) takes the standard form. But growth is still affected by status: As will be seen below, this effect will arise because status considerations impinge on labour supply and the real interest rate.[xvii] Note that a common growth rate also implies (by 8 and 9) a common real interest rate and output-to-capital ratio across firms.

From equation (7), we obtain:

$$L_i = \frac{(1-\tau)(1-\mu)\lambda(1+\phi_i)}{\beta}\frac{Y_i}{C_i} \qquad (10)$$

Note that if there is no disutility of labour (if β tends to zero), we obtain a corner solution, whereby individuals allocate their entire labour time to output production: $L_i=1$ for all i.

The next key equation is established from the resource constraint (4). Since the consumption-output ratio is constant in the steady state and common across agents (see equation (8)), the budget constraint (4) with the balanced government budget (5) implies:

$$C_i = (1-\tau)Y_i - gK_i + \theta C \ , \quad \forall \text{ i} \qquad (11)$$

where we recall that the un-subscripted consumption refers to the aggregate/average. However, θ is not a parameter, but one that should be consistent with the aggregate resource constraint. The government budget constraint (5) (aggregated) yields $\tau Y = \theta C$. The aggregate resource constraint, on the other hand, is given by: Y=C+gK (since there are no government expenditures). Combining these two, together with the Euler equation (8) and the real interest rate (9), we get:

$$\theta = \frac{\tau}{\tau + \lambda(1-\tau) + \rho K/Y}. \qquad (12)$$

We note that $\tau<\theta<1$ and that

$$0 < \frac{\partial\theta}{\partial\tau} = \frac{\lambda + \rho K/Y}{\left(\tau + \lambda(1-\tau) + \rho K/Y\right)^2} < 1.$$

This assumes that the effect of the tax rate on this ratio via the capital-output ratio is, to a first approximation, zero (it can be seen that this effect will be proportional to $\tau(1-\lambda)\rho$/denominator^2). For future use, we note that a conservative value for θ would arise from the customary labour elasticity in production of $\lambda=0.65$, a state sector of about $\tau=0.3$ ($1-\tau=0.7$) (Tanzi and Schuknecht, 2000), a rate of time preference of $\rho=0.02$ and a capital-output ratio K/Y=3 (see P. Romer, 1989). Therefore, we have a likely $\theta=0.375$. Variations in terms of these parameters may produce slightly different values for θ.

Combining (11) with (8) and (9) yields:

$$C_i/Y_i = \rho K_i/Y_i + (1-\tau)\lambda + \theta(C/C_i)(C_i/Y_i) \ , \qquad (13)$$

As Bertola (1993) and Alesina and Rodrik (1994) have made clear, the individual consumes their entire labour income plus a fraction ρ of their financial assets (capital). Here, labour income is implicitly given by the marginal product of labour times labour: λY_i. This basic

distinction is adjusted for the redistributive effects of taxation. This is strongest naturally for those lower down the distribution (low $X_i^C \equiv C_i / C$) and enhances the consumption obtainable otherwise.

From (8) and (9), we may write $Y_i / K_i = (g+\rho)/[(1-\tau)(1-\lambda)]$; as mentioned, this quantity is constant across firms in the steady state. Using this into (13) and further into the labour supply (10), we obtain an alternative form of the labour supply as follows:

$$L_i = \frac{(1-\mu)(1+\phi_i)}{\beta} \frac{G(1-\theta / X_i^C)}{\lambda G + (1-\lambda)\rho}, \qquad (14)$$

where $G \equiv g + \rho$ may be called the gross growth rate (which from (9) is also seen to be equal to the after-tax real interest rate, but its interpretation as a growth-related quantity is more useful here). Equation (14) shows that a necessary condition to avoid a corner solution (i.e. zero labour supply) requires $\theta / X_i^C < 1$, $\forall$i, which we assume to be satisfied. The $X_i^C \equiv C_i / C$ distribution needs to be compressed accordingly; this requires individuals to be heterogeneous but close enough to each other in terms of skills, and idiosyncratic status.

Note that, the tax rate does not affect labour supply directly, but it does through growth and the θ-redistribution parameter.

Using (9) and the production function (1), the growth equation (8) may be re-written as:

$$G = (1-\tau)(1-\lambda) A_i (X_i^K)^{-\lambda} L_i^{\lambda}, \qquad (15)$$

where G is gross growth rate ($G \equiv g + \rho$) and we have denoted: $X_i^K \equiv K_i / K$.

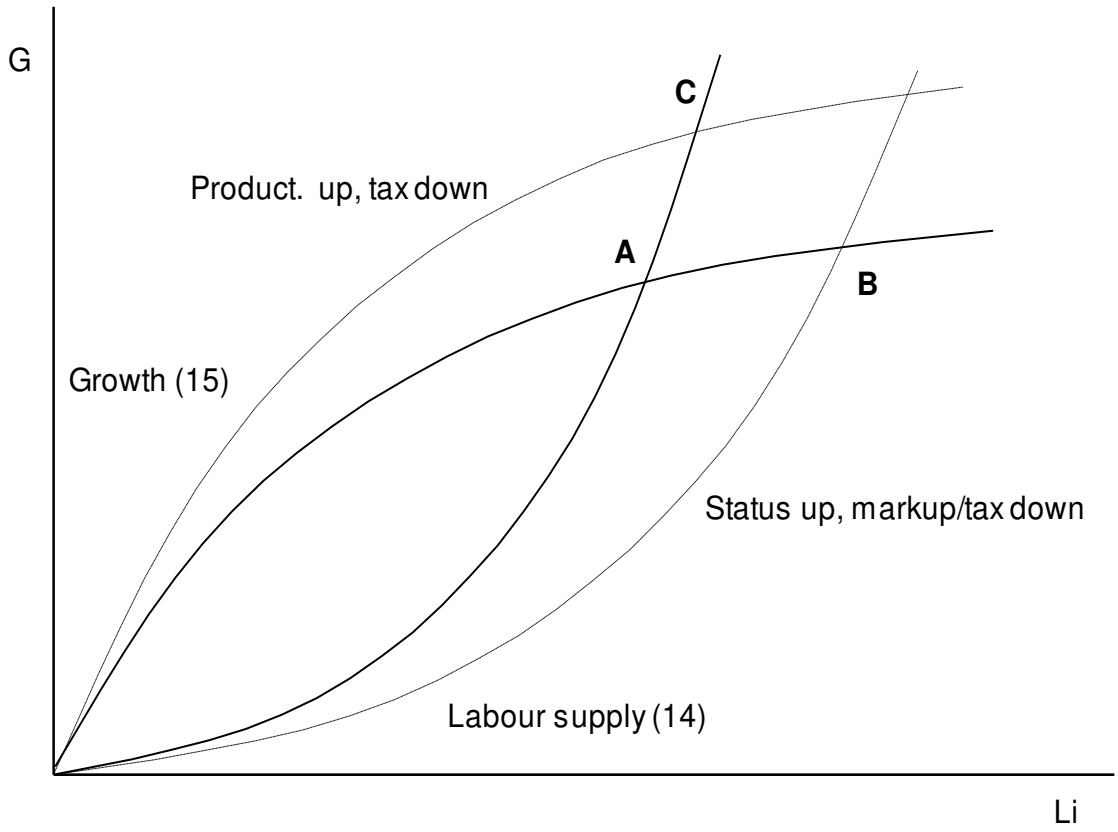
Holding at this stage the relative positions X_i^C and X_i^K as exogenous (i.e., for a given agent i), equations (14 – labour supply) and (15 – gross growth rate) form a system in (G, L_i) that is at the core of the model. To aid intuition, we depict it graphically (Figure 3).

From (14) and (15), both schedules are readily checked to be monotonically increasing, however (14) is convex while (15) concave. In particular, growth depends positively on labour, but the slope becomes flatter because of diminishing returns. Labour supply depends positively on growth as this increases the output-consumption ratio in a convex way, which in turn decreases the ratio of marginal disutility of labour to the marginal product of labour. As a result, the labour supply locus is convex.

Changes in the institutional factors we are considering in this paper shift the schedules in the way shown in Figure 3. Productivity shifts the growth schedule;[xviii] it does not affect the labour supply as hours of work cannot trend in the steady state (unlike productivity – see e.g. King, Plosser and Rebelo, 1988). A rise in productivity moves the equilibrium from A to C: both growth and the labour supply increase, but the impact on growth is greater. An intensification of the status-seeking motive, on the other hand, affects directly labour supply, and then affects growth in the same direction, but by less because of diminishing marginal returns (A to B). An increase in taxes shifts on the growth schedule downwards, decreasing both growth and labour supply (C to A), but more growth than labour supply. Finally, both increases in both types of market imperfections, in particular firm's monopoly power in the product market (μ), and workers' monopoly power in the labour market (β), shift the labour

supply inwards (i.e., they both reduce labour supply given the rate of growth, the opposite effect of an increase in status), with a decline in hours more than growth.

Figure 3: Growth and individual-i labour supply



While these changes move the economies between points A and B consistently with the evidence, one of them is incompatible with the specifics. Europe is usually associated with more workers' power (via trade unions, see, e.g., Nickell, 1997), i.e. a higher β, which would indeed push her to occupy A. With a higher labour supply, the US is schematically at B. For this to happen, it must have either lower firm monopoly power, or lower worker power, or both. While the US may plausibly be associated with a lower worker power (through a lower degree of unionisation), it may also plausibly be considered to have a higher firm power (through its industrial conglomerates), i.e. a higher μ; but this is inconsistent with it occupying point B. On the other hand, variation in status motives may be compatible with the evidence, if the US is thought to be more motivated by status (through the pursuit of the American dream). If so, status considerations appear to work in the right direction, in the sense that they are consistent with the evidence. Labour market imperfections appear to be a contender to status in explaining the noted regularities concerning growth and labour supply; but product market imperfections produce counterintuitive results.

We are therefore in a position to establish formally some intermediate results:

Proposition 1: Effects on labour supply and growth:
Given the relative position of the individual, $X_i^C \equiv C_i / C$, (equal in the steady state to the relative position in terms of capital).

(a) A rise in the intensity of status-seeking motive raises both growth and labour supply, but the latter more.
(b) A rise in productivity also raises both variables, but the balance between the two effects is the opposite than in (a).
(c) A rise in the (flat) rate of tax reduces both variables, with a higher effect on growth.
(d) A rise in both product and labour market imperfections reduces both variables, but the relative magnitudes vary.

Proof:
Easily verified from total differentiation of (14) and (15). Notes are available on request. □

These results are interesting because they raise the possibility that, among the four types of exogenous development considered here, possible differences in attitudes to status and in labour market imperfections across time and/or countries seem to hold most promise in explaining empirical regularity (b) reported in sub-Section 2.5.

We now proceed to examine the relevance of these factors for stylised facts (a) and (c).

4. A system in growth and distribution (variance)

The growth-labour supply system derived above (equations 14-15) was cast in terms of individual variables. The aim of this Section is to develop a counterpart system in growth, variance of (relative) consumption and mean labour supply. In doing so, we shall see that mean growth is affected by the variance, through the status elasticity (ϕ). Furthermore, by (3), the variance of consumption is a function of growth itself. Thus, a 2x2 system emerges in this Section in growth and variance of relative consumption. We discuss each equation in turn, before proceeding in the next Section, to derive the reduced form of the system, at which point we shall also discuss labour supply. Thus, this Section is an intermediate one, discussed at some length for more intuition.

Introducing labour supply (14) into growth (15), we get the following expression for the gross growth rate $G \equiv g + \rho$:

$$G = (1-\tau)(1-\lambda)A_i (X_i^K)^{-\lambda} \left(\frac{(1-\mu)(1+\phi_i)}{\beta} \frac{G(1-\theta / X_i^C)}{\lambda G + (1-\lambda)\rho} \right)^{\lambda},$$

or

$$\tilde{G} = (1-\tau)(1-\lambda)A_i (X_i^K)^{-\lambda} \left(\mathrm{B}(1+\phi_i)(1-\theta / X_i^C) \right)^{\lambda}, \qquad (16)$$

where we have used the shorthand expressions $\tilde{G} \equiv G^{1-\lambda}\left(\lambda G + (1-\lambda)\rho\right)^{\lambda}$, and $\mathrm{B} \equiv (1-\mu)/\beta$.

In order to proceed, we invoke an intermediate result, which is of some interest in itself. The result concerns the relationship between the consumption and capital distributions in the steady state. To begin, rewrite (13) as $C_i = \rho K_i + (1-\tau)\lambda Y_i + \theta C$, and divide by the mean consumption, to get:

$$X_i^C = X_i^K \left(\rho + (1-\tau)\lambda Y_i / K_i\right)(K/C) + \theta$$

At the same time, we can aggregate the above, to get:

$$C = \left(\rho K + (1-\tau)\lambda Y\right)/(1-\theta)$$

Or

$$C/K = \left(\rho + (1-\tau)\lambda Y/K\right)/(1-\theta)$$

Combining with the previous, we have:

$$X_i^C = X_i^K(1-\theta) + \theta \tag{17}$$

This is so because the output-private capital ratio is common across agents, and therefore across the aggregate, as it is proportional to the common real interest rate (see 9). Conditional on the consumption distribution, driven by exogenous skills and status motive heterogeneity, the above equation (17) endogenises the wealth distribution.

Raising to power 1/λ and re-arranging, we can write (16) as:

$$X_i^K X_i^C/(X_i^C - \theta) = \left((1-\tau)\tilde{G}^{-1}(1-\lambda)A_i\right)^{1/\lambda}\left(\mathrm{B}(1+\phi_i)\right) \tag{16'}$$

Using (17), this is simplified as:

$$X_i^K + \theta/(1-\theta) = \left((1-\tau)\tilde{G}^{-1}(1-\lambda)A_i\right)^{1/\lambda}\left(\mathrm{B}(1+\phi_i)\right) \tag{16''}$$

or

$$X_i^C/(1-\theta) = \left(\tilde{G}^{-1}(1-\tau)(1-\lambda)A_i\right)^{1/\lambda}\left(\mathrm{B}(1+\phi_i)\right) \tag{16'''}$$

From this, it immediately follows that the variances of consumption and wealth are related by:

$$Var(X_i^C) = (1-\theta)^2 Var(X_i^K)$$

$\mathrm{VarX^K} \geq \mathrm{VarX^C}$, with the difference increasing with redistribution. This is in line with empirical evidence that the variance of wealth is greater than the variance of income.

We now take logs of (17), using $\log(1+\phi_i)\approx\phi_i$ and (3), to get:

$$\begin{aligned}&(1-\phi_1)\log X_i^C - \log(1-\theta) = \\ &= (1/\lambda)\log\left(\tilde{G}^{-1}(1-\tau)(1-\lambda)A_i\right) + \log \mathrm{B} + \phi_i^0 + \phi_2 Var(x_i^C)\end{aligned} \tag{18}$$

Taking variances, we readily get:

$$Var(x_i^C) = \frac{Var(a_i)/\lambda^2 + Var(\phi_i^0)}{(1-\phi_1)^2} \qquad (19)$$

This equation reaffirms the two exogenous, and orthogonal, drivers of heterogeneity in consumption, namely the skills (A_i) and status motivation (ϕ_i^0) heterogeneity. The variance of consumption increases in the variances of both. The key insight offered by (18), however, is related to the role of differential status motivation, ϕ_1. The variance of consumption rises exponentially with this parameter. Thus, a marginal increase from the benchmark value of zero will produce more variance of consumption if this is going towards gains ($\phi_1>0$) than if going towards pains ($\phi_1<0$). The following proposition recapitulates:

Proposition 2: On inequality:
(a) Inequality rises with both skills and exogenous status-motivated inequality.
(b) Gains from status increase the variance as the motivated (by ability or ambition) individuals also work harder; pains mitigates the variance, as it motivates individuals not to be left behind;
(c) Redistributive taxation does not affect the variance of log-consumption, but is important for the distribution of consumption in levels;
(d) Likewise, the monopoly power of unions or firms is irrelevant for the distribution of log-consumption.

Proof: All clauses follow from (18). □

Rather counterintuitively, neither redistributive taxation nor monopoly power (either form union or firm), affect the variance of log-consumption. This is due to the scaling in taking logs, whereby all multiplicative terms become additive constants, and hence do not affect the variance. In contrast, the variance of relative consumption in levels (not logs) will in general be affected by both redistribution and monopoly power of firms and workers. To see this, we need to go back to (16''') and write $1+\phi_i \approx \exp\{\phi_i\}$ and then take variances, to get:

$$Var(X_i^C) = \left(\tilde{G}^{-1}(1-\tau)(1-\lambda)\right)^{2/(\lambda(1-\phi_1))} \mathrm{B}^{2/(1-\phi_1)} \left(Var((A_i/\lambda)\exp\{\phi_i^0 + \phi_2 Var(x_i^C)\}\right)^{1/(1-\phi_1)}$$

Given the variance of log consumption from (19), this makes clear that the variance of the level is a complex function of the exogenous variances and taxation/redistribution (both of which lower the variance), and monopoly power of both unions and firms (implicit in B, both of which also decrease the variance).

Finally, we develop an expression for growth. Taking (18) again, reverting to levels, taking means (noting that $EX_i=1$ by assumption), and re-arranging, we get:

$$(1-\phi_1)Ex_i^C - \log(1-\theta) = (1/\lambda)\log\left(\tilde{G}^{-1}(1-\tau)(1-\lambda)\right) + (1/\lambda)\alpha + \log \mathrm{B} + \phi_0 + \phi_2 Var(x_i^C)$$

Using the fact that $1=E(X)=\exp\{Ex+Var(x)/2\}$, which is accurate in the case of log-normality, otherwise an approximation, we have, $Ex = -Var(x)/2$, therefore:

$$-\log(1-\theta) = (1/\lambda)\log\left(\tilde{G}^{-1}(1-\tau)(1-\lambda)\right) + (1/\lambda)\alpha + \log \mathrm{B} + \phi_0 + (1/2 - \phi_1/2 + \phi_2)Var(x_i^C)$$

And from this:

$$\tilde{G} = (1-\theta)^{\lambda}(1-\tau)(1-\lambda)\left(a + (\phi_0)^{\lambda}\right)\mathrm{B}^{\lambda} \exp\left\{\lambda(1-\phi_1+2\phi_2)Var(x_i^C)/2)\right\} \qquad (20)$$

Mean skills and status motivations ($\alpha+\phi_0$) fuel growth. The interesting feature here is that taxation (both in its distortionary role and through redistribution) decreases growth as they decrease the mean marginal product of capital. Furthermore, the variance of (log) consumption has an ambiguous effect on growth, depending on the differential status motivation parameter and the effect of variance on status. If pains exist ($\phi_1<0$, and are strong enough to offset the demoralising effect of a higher variance, so that $-\phi_1+2\phi_2>0$), then a higher variance elicits a higher average labour supply as a greater mass of individuals make a higher effort in order not to be left behind. Thus, as far as status considerations are concerned, a growth-equality trade-off emerges. However, the overall picture is unclear at least for two reasons: Firstly, because of redistribution which elicits the opposite relation (it decreases both the variance and growth). Secondly, though pains ($\phi_1<0$) is the more plausible case in view of the evidence discussed above, it is at least theoretically possible for gains to prevail ($\phi_1>0$), in which case labour supply falls with higher variance because the latter implies a smaller mass of leaders who are motivated to work harder (given the right-skewness of the income distribution). Thus, just a simple statement on any trade-off may be misleading, as both growth and variance are endogenous variables, and how they change depends crucially on the shocks that hit the system.

The get the full picture, we develop the final reduced form of growth. Introducing variance (19) into growth (20), we get:

$$\tilde{G} = (1-\theta)^{\lambda}(1-\tau)(1-\lambda)\left(a+(\phi_0)^{\lambda}\right)\mathrm{B}^{\lambda}\exp\left\{\lambda\frac{1-\phi_1+2\phi_2}{2(1-\phi_1)^2}[Var(a_i)/\lambda^2+Var(\phi_i^0)]\right\} \quad (21)$$

The same structure is essentially retained as in the semi-reduced form (20). Average productivity and status motivation are beneficial for growth, as expected. Redistribution unambiguously harms growth as it reduces the labour effort – see (16). As in (20), the differential status effect plays an important role. Formally, we can state:

Proposition 3: Determinants of the aggregate growth rate.
(a) Growth increases with mean exogenous productivity and status;
(b) The effect of exogenous heterogeneity is ambiguous, depending on the sign of the differential status effect and the effect of variance on status (ϕ_2);
(c) The differential status effect affects growth positively in the case of pains and negatively in the case of gains;
(d) Redistribution harms growth;
(e) Both types of monopoly power decrease growth.

Proof: All clauses follow from (21). □

How does this all help explain the stylised facts of Section 2? Firstly, let us note that heterogeneity is made up of skills heterogeneity and also motivation (status-related) heterogeneity; both these two exogenous sources of variance affect both inequality but may also have implications for growth. Note in particular, that if pains is combined with a weak negative effect of variance in utility, as may well be plausible in view of the evidence, so that $\phi_1+2\phi_2\approx 0$, then exogenous heterogeneity affects the variance but not growth. Any variation of it, either in the cross-section or across time, may have stronger effects on inequality than on growth, which seems to be the evidence.

Another interesting feature of variance (19) in particular, is the role of the differential status effect ϕ_1. Even in otherwise identical economies in terms of exogenous heterogeneity, how agents respond to it will affect all final outcomes, i.e. both the variance of consumption and

growth. Though the plausible case is $\phi_1<0$ (pains), there is no presumption that this parameter will be equal across countries. We may envisage better reasons for this if we hypothesise that this parameter reflects an average in society, rather than a constant for all individuals. Thus, in economies where more individuals derive status-related satisfaction, e.g. by emphasis on a dream to be pursued, then $|\phi_1|$ may be lower than elsewhere (while on average $\phi_1<0$ in all societies). In societies more averse to individuals being left behind, though, $|\phi_1|$ will be higher. *Ceteris paribus,* the latter societies will feature a lower variance (fewer individuals left behind) and higher growth (less leaders motivated to work harder). The relevance of these considerations is that any findings of greater inequality in the US and UK compared to continental Europe, or in recent times compared to earlier post-war decades, may be explained by appeal to status. This presumes, of course, that status-related motivation differs between countries and/or that it has changed across time. The analysis of this paper suggests that this is a line of argument worth exploring further.

5. Factor shares

Finally, we develop the factor shares in this framework. Strictly speaking, factor shares cannot be properly investigated here as they are exogenously fixed by the elasticities of the privately-owned factors in the Cobb-Douglas production function. But consumption shares (shares net of the expenditure on accumulation) are endogenous and the effect of status on these can be investigated. Referring back to consumption (13), we may write the ratio of total consumption over consumption derived from capital ownership only for any agent i as:

$$\frac{\mathrm{C_i^{total}}}{\mathrm{C_i^{capital}}} = \frac{\rho + (1-\tau)\lambda \mathrm{Y_i/K_i} + \theta(\mathrm{C/K})(\mathrm{K/K_i})}{\rho}$$

This quantity gives the inverse of the capital share in each individual's consumption - the inverse of the proportion of consumption that can be attributed to capital income. If we average this quantity over i, we get an idea about (the inverse of) the capital share. Taking expectations over i (affecting only the numerator), introducing C/K=(Y/K)(1-τ)-g from national income accounting, and using the economy-wide interest rate (9) and the consumption Euler equation (8), we get:

$$E\frac{C_i^{total}}{C_i^{capital}} = \frac{\rho + (1-\tau)\lambda E\left(A_i (X_i^K)^{-\lambda} L_i^{\lambda}\right) + \theta\left((g+\rho)(1-\lambda)^{-1}(1-\tau)^{-1} - g\right)E(X_i^K)^{-1}}{\rho} \quad (22)$$

The first expectation in the numerator may be seen from the labour supply (14) and growth (16) to boil down to:

$$EA_i (X_i^K)^{-\lambda}\left(\mathrm{B}(1+\phi_i)(1-\theta/X_i^C)\right)^{\lambda} = \tilde{G}(1-\tau)^{-1}(1-\lambda)^{-1}$$

so that the above becomes:[xix]

$$E\frac{C_i^{total}}{C_i^{capital}} = \frac{\rho + \tilde{G}\lambda/(1-\lambda) + \theta\left((g+\rho)(1-\lambda)^{-1}(1-\tau)^{-1} - g\right)\exp\{Var(x_i^K)\}}{\rho} \approx$$

$$\approx \frac{\rho + \tilde{G}\lambda/(1-\lambda) + \theta\left((g+\rho)(1-\lambda)^{-1}(1-\tau)^{-1} - g\right)\exp\{Var(x_i^C)\}}{\rho} \quad (22')$$

The second (approximate) equality uses an approximate equality of the variances of log-consumption and log-capital based on their relation (17). This quantity unambiguously increases with growth but falls with the exogenous variance of (log) consumption. It is, therefore, affected by the various fundamentals in the same way as is growth. Since the consumption variance is exogenous, the ratio also increases with a rise in taxation and redistribution (introduced by τ and θ), so that the capital share falls with redistribution. The variance term at the end, similar to the variance term in growth, represents a Jensen inequality effect: At its root is the intensity of redistribution for the individual, which rises as the relative position falls. As variance rises, so do the tax receipts and the intensity of redistribution, and the capital share falls.

Proposition 4: On (consumption) factor shares
(a) The consumption capital share falls with growth;
(b) It also falls with the intensity of redistribution and with variance, as in this case the effect of any redistribution mechanism in place becomes more pronounced.

Proof: Straightforward observation of (22'). □

From the point of view of reconciling the above with the evidence presented in Section 2, we should be seeing the capital share to be negatively (partially) correlated with growth, the intensity of redistribution, and variance of (log) consumption. It should by implication also be negatively related to labour supply, itself positively related to growth. In fact, the evidence reviewed may be interpreted to suggest that the capital share is positively correlated with labour supply (e.g., the US has more of each than Europe). This observed positive correlation between capital share and labour supply is an anomaly in relation to the above results.

6. Labour supply

Finally, we turn to a reduced form of the labour supply, in order to ascertain what this framework can tell us about labour supply, and stylised fact (b). Averaging over (14), mean labour supply is:[xx]

$$L = \frac{(1-\mu)\left(1+\phi+(\phi_2-\phi_1/2)Var(x_i^C)\right)}{\beta}\frac{G\left(1+\theta\exp\{-Var(x_i^C)\}\right)}{\lambda G+(1-\lambda)\rho} \qquad (23)$$

Again, log-normality of consumption has been assumed as approximation in (23). Accordingly we have:

Proposition 5: On labour supply
(a) Mean labour supply rises with the average status effect (a measure of average motivation/ambition);
(b) The effect of variance is unclear as it is the synthesis of the differential status effect (ϕ_1), the effect of variance on the status motive (ϕ_2), and the Jensen inequality effect related to redistribution. Under the maintained hypothesis of $\phi_2<0$, in the case of gains ($\phi_1>0$), the effect is clearly negative. Hence, more unequal societies motivated by the pursuit of a dream will tend to work harder. But in the more empirically plausible case of pains ($\phi_1<0$), the relation between labour supply and inequality is ambiguous.

Proof: Straightforward observation of (23). □

Again, from the point of view of reconciling theory and evidence, and following on from the discussion of Figure 3, the average status effect has a stronger effect on the labour supply than productivity (whose effect only comes through indirectly, via growth and possibly variance). In other words, any differences across countries or time in status will manifest themselves relatively more in labour supply than growth relative to equivalent differences in productivity. Hence, since the evidence shows more cross-country and inter-temporal variation in labour supply than growth, there is an indication that cultural and behavioural elements like the status motivation differ more across countries and possibly time. As discussed in the context of growth, a higher aversion towards being left behind (pains) implies more labour supply by a greater mass of individuals. An anomaly here is the possibly negative partial correlation between inequality and labour supply, reinforced in particular when we have gains from status and a stronger redistribution. We observe a higher inequality and a higher labour supply in the US with its can do, and therefore gains, culture, whereas the predictions of the above formula are ambiguous. A further complicating factor is redistribution (θ, higher in Europe) which increases labour supply directly, but also decreases the variance, which has an ambiguous effect on labour supply.

7. Conclusions

The main objective of this paper is to make an exploration into the macroeconomics of status-seeking, and analyse to what extent this aspect of a model is a fruitful area of research, particularly in terms of explaining a range of empirical observations. More specifically, we begin by surveying some stylised facts related to inequality, labour supply, and factor shares, not traditionally addressed by macroeconomics; we argue that various pieces of information point towards a picture in which these variables are changing in certain ways. Though more details are required for full understanding, we argue that these observations are now robust enough to be elevated to the status of stylised facts. Most of the subsequent paper is devoted to the development of an organising framework made up of a basic growth-distribution (canonical) model with status as an innovation. We then informally ask to what extent the status motivation, alongside some other features of the model, can help us to account for the stylised facts mentioned above.

The model is otherwise a variant of the AK model with variable labour supply. Ongoing growth is guaranteed by production spillovers a la Romer (1986). The variance of income and consumption arises from heterogeneity in individual-specific productivity and also heterogeneity in the status motivation. We make an important distinction between the average and differential status motivation, the former being randomly distributed across individuals, the latter determining the curvature of the status function with respect to the individual's relative position. Gains from status, i.e. convexity, imply that the individual gains increasingly more status-related satisfaction as they move up the ladder, whereas the more plausible pains imply that the individual cares more in not being left behind.

We then build the status motive described above into this canonical macro model. Alongside status, we consider redistributive taxation, market imperfections (in either product or labour markets), and productivity. We ask whether these factors can help us understand the stylised facts mentioned, related in particular to inequality, labour supply and factor shares, and their relation to growth. The specific aim is to examine qualitatively whether status is a better candidate for explanation and fruitful avenue for further investigation in relation to the other factors we consider.

The results have been stated above in detail, so we refrain from repeating them here for economy of space in an already long paper. Suffice it to say that the status motive can help explain why we have more labour supply in the US rather than Europe while the difference in growth rates is not so pronounced; it can also provide fruitful suggestions as to the possible

root causes underlying the developments in inequality and factor shares. And, partly due to its rich structure, the status motive does better as an overall explanation for the reported empirical regularities than any of the other factors we consider. Thus, the overall conclusion is that status is a fruitful avenue for further macroeconomic research in its quest to analyse socio-macroeconomic developments like the ones reported in Section 2. Because of the limited (but expanding) empirical information about the precise nature of the status motive, in particular, applied research aiming to clarify that should be especially promising.

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NOTES (not for publication)

1. On the derivation of (12). The government budget constraint (5) (aggregated) yields $\tau Y = \theta C$. The aggregate resource constraint, on the other hand, is given by: Y=C+gK (since there are no government expenditures). Combining these two, together with the Euler equation (8) and the real interest rate (9), we get:

$$\theta = \tau Y / C = \tau \frac{C + gK}{C} = \tau + \tau \frac{(1-\lambda)(1-\tau)Y - \rho K}{C} = \tau + \theta(1-\lambda)(1-\tau) - \theta\rho Y / K$$

Re-arranging this, we get (12). Obviously, θ<1. To get the first part of the inequality (that τ<θ), we develop:

$$\theta = \tau Y / C = \tau \frac{Y}{Y - gK} = \tau \frac{1}{1 - g(1-\lambda)(1-\tau)/(g+\rho)} > \tau$$

2. On the derivation of (14). The key point is that we cannot use the aggregate resource constraint (Y=C+gK).

Instead, we re-arrange $C_i / Y_i = \rho K_i / Y_i + (1-\tau)\lambda + \theta(C / C_i)(C_i / Y_i)$ and combine this with $Y_i / K_i = (g+\rho)/\big((1-\tau)(1-\lambda)\big)$ to insert into (13). $L_i = \frac{(1-\tau)(1-\mu)(1+\phi_i)}{\beta} \frac{Y_i}{C_i}$.

This readily yields (14).

3. *A parametric example of the status elasticity (3) – this follows Tsoukis (2007)*

The literature has utilised a number of parameterisations of the status function $f(\bullet)$; they may be nested as follows:

$$f_{i,t}(X_{i,t}^C) \equiv (C_{i,t} - \gamma_0 \overline{C}_t)^{\gamma_1} (X_{i,t})^{\gamma_2} [H(X_{i,t})]^{\gamma_3}$$

$$0 < \gamma_0, \gamma_1, \gamma_2, \gamma_3 < 1$$

- γ_1 introduces the linear-in-mean comparison utilised by Gali (1994) and others;
- γ_2 shows the multiplicative-in-mean comparison (Abel, 1990);
- γ_3 shows the importance of status, whereby utility depends on rank (the position on the cumulative distribution H(.) – Corneo and Jeanne, 2001; Hopkins and Kornienko, 2004).

The reference value is

$$\overline{C}_t \equiv \delta C_t + (1-\delta) C_{t-1} \approx C_t [1 - (1-\delta) g]$$

with consumption without the agent-specific subscript i being the mean, 0<δ<1 parameterising the keeping up portion and 1-δ the catching up portion of the Joneses/status effect, and g being the growth rate. The last equality occurs in the steady state.

Tsoukis (2007) derives the elasticity parameters ϕ_0 and ϕ_1 arising from each of the nested specifications. Specific cases include:

- In the additive case ($\gamma_1>0$, $\gamma_2=\gamma_3=0$), the elasticity is
-

$$\phi_i = \gamma_1 \frac{1+\gamma_0 X_i^{-2}[1-(1-\delta)g]^{-2}}{1-\gamma_0 X_i^{-1}[1-(1-\delta)g]^{-1}} \qquad (2')$$

- in which case we shall have $\text{sgn}\{\phi_1\} < 0$; we may also hypothesise $\text{sgn}\{\phi_2\}<0$ on the previous reasoning. In other words, this specification only allows for a pains-dominated differential status effect.
- We also see that the growth rate interacts with relative position, in particular the differential status effect ϕ_1; specifically, we have $\partial\phi_1/\partial g<0$ with $\phi_1<0$. The interpretation here is that higher growth intensifies the urgency of (the less capable) agents not to be left behind.
- Multiplicative comparison only ($\gamma_2>0$, $\gamma_1=\gamma_3=0$). In this case ϕ_i will be constant ($=\phi_0^i=\gamma_2$). In this case, there are no differential status effects of any sign.
- Rank comparison only ($\gamma_3>0$, $\gamma_1=\gamma_2=0$). In this case, ϕ will be constant, providing income distribution takes the form $H(X)=X^{\delta}$, as in Corneo and Jeanne (2001). But this functional form does not correspond to any of the benchmark distributions, nor is it a form that has been used in empirical studies of income distribution in particular.
- The general case involves a mixture of all these effects.

The main points are that pains ($\phi_1<0$) may be the more prevalent form of the differential status effect, though gains must not be entirely precluded a priori; and that this phenomenon may be intensified under conditions of higher growth.

3. Comparative statics of the system (14)-(15) can be re-written as (formal proof of the intuitive moves given in Figure 3).

From (14)-(15), we have:

$$G = (1-\tau)(1-\lambda)A_i(X_i^K)^{-\lambda}\left(\frac{(1-\tau)(1-\mu)(1+\phi_i)}{\beta}\frac{G(1-\theta/X_i^C)}{\lambda G+(1-\tau)(1-\lambda)\rho}\right)^{\lambda},$$

and

$$L_i = \frac{(1-\tau)(1-\mu)(1+\phi_i)}{\beta}\frac{(1-\tau)(1-\lambda)A_i(X_i^K)^{-\lambda}L_i^{\lambda}(1-\theta/X_i^C)}{\lambda(1-\tau)(1-\lambda)A_i(X_i^K)^{-\lambda}L_i^{\lambda}+(1-\tau)(1-\lambda)\rho}.$$

From these, we can establish:

$$dL/L = -d\tilde{\tau} + d\tilde{\phi} - d\tilde{\mu} + \left(dG/G + d\tilde{\tau}\right)\frac{(1-\tau)(1-\lambda)\rho}{\lambda G+(1-\tau)(1-\lambda)\rho}$$

and

$$dG/G = -d\tilde{\tau} + da + \lambda dL/L$$

where subscripts are dropped, and where:

$$d\tilde{\tau} \equiv d\tau/(1-\tau), \qquad d\tilde{\phi} \equiv d\phi/(1+\phi), \qquad d\tilde{\mu} \equiv d\mu/(1-\mu), \qquad d\alpha \equiv dA/A$$

Thus, the final reduced forms are:

$$dL/L = \frac{-d\tilde{\tau} + d\tilde{\phi} - d\tilde{\mu} + \Gamma da}{1-\lambda\Gamma}, \qquad (14')$$

$$dG/G = \frac{-(1-\Gamma\lambda+\lambda)d\tilde{\tau} + \lambda(d\tilde{\phi} - d\tilde{\mu}) + da}{1-\lambda\Gamma} \qquad (15')$$

where $\Gamma \equiv \frac{(1-\tau)(1-\lambda)\rho}{\lambda G + (1-\tau)(1-\lambda)\rho} < 1.$

From these, it immediately follows that that all effects affect the two variables in the same direction (i.e., for each change considered, not across changes). But the size of the effects are unequal, as noted: An increase in the status motive is felt mostly on labour supply; that of an improvement in productivity mostly on growth; that of taxes mostly on growth, and that of monopoly power mostly on labour supply.
Noting that $\Gamma<1$, the (steady-state) comparative statics mentioned in the main text are verified.

Endnotes

[i] This idea is sometimes referred to as negatively interdependent preferences (Boskin and Sheshinski, 1978; Ok and Kockesen, 2000). However, one may be argue that this is not appropriate as preferences depend on *mean consumption*; thus, while the outcomes of preferences are interdependent preferences themselves are not. Below, we refer to this effect interchangeably as the keeping up with the Joneses effect and the status effect.
[ii] Abel (1990) puts in sharp relief the analogy between keeping up with the Joneses and habit formation (Constantinides, 1990). In both cases, the consumer compares their level of consumption with some reference level; under habit formation, the reference is made up of own past consumption, while under keeping up the reference is made up of others' consumption.
[iii] The interested reader is referred to the above reviews and the helpful discussion in Clark and Oswald (1998) for references.
[iv] More generally, comparisons can be to a variety of standards, quite possibly internal as much as external: past situation and habits, aspirations, needs and ideals, as well as norms, and other people's achievements. So, as Senik (2007) stresses, the framework of comparisons is very flexible. In particular, our analysis does not preclude the possibility that comparisons to internally-set benchmarks (habits) is equally, or even more, important. Also, Tournemaine and Tsoukis (2008, 2009) argue that such keeping up or status motivation, can be manifested with regard to wealth or even jobs (status jobs). Our analysis would be complementary to those possibilities.
[v] Interestingly, Caporale *et al.* (2008) find evidence of a tunnel effect for Eastern Europe, whereby reference income enhances happiness, rather than decreasing it; this is probably because it provides information about future living standards of the individuals concerned.
[vi] It is also not entirely clear to whom individuals compare themselves to (see Senik, 2007). In common with much macroeconomics literature, we assume that individuals compare themselves with general society.

[vii] Because of the emphasis on placing the economic agent in a social context (e.g., by considering such issues as social comparison and status) and on issues of wider social concern (e.g., distribution), the related branch of literature may be termed socio-macroeconomics. We return to this point in the Conclusions. But because of the long-term nature of this analysis, business cycles considerations are omitted.

[viii] Public concern about this is reflected in writings in the popular press like Guardian (2004, 2006).

[ix] Accordingly, comparisons in a linear distance form may be represented as $f(C_{i,t}, \overline{C}_t) = 1 - a(C_{i,t} / \overline{C})^{-1}$, with 0<a<1, while the ratio, or relative distance, form can be represented $f(C_{i,t}, \overline{C}_t) = (C_{i,t} / \overline{C})^{-a}$, with 0<a<1.

[x] Clark and Oswald (1998, footnote 7) make explicit the analogy between concavity of the $f(\bullet)$ function (pains) and risk aversion. Tversky and Kahneman (1991) analyse the concept of loss aversion in the context of riskless choice, much as the $f(\bullet)$ function evaluates riskless outcomes. In this respect, the results of Dynan and Ravina (2007) are a dissonant voice, in that they seem to show that comparisons are important for those above the external reference value. But the bulk of both theoretical argument and empirical evidence favours the assumption stated in the text.

[xi] Whether this finding represents a genuine inclusion of inequality in the utility function or whether it is the effect of less social mobility in Europe, as Alesina *et al*. (2004) argue, is a moot point and a less central one from our point of view. Whether because of idealism or because they feel they cannot catch up, people will be hurt by inequality.

[xii] See also Tsoukis (2007, Section 3.1).

[xiii] To see this more clearly, note that $C_{i,t}/C_{t-1}$ can be written in the steady state as $(1+g)C_{i,t}/C_t$, where g is defined as the growth rate of consumption. Thus, growth appears to enhance the feelings of status, though in the steady state all individual consumptions grow at the same rate, so relative standing does not depend on the growth rate. The existence of this kind of status illusion may well be supported along arguments that support the existence of money illusion (see Akerlof and Shiller, 2009).

[xiv] In fact, the budget constraint will be balanced in the steady state, but not necessarily in transition. This is because we shall fix θ as a constant, consistent with first order conditions in the steady state (as this will be our focus). However, the possibility of an unbalanced budget during transition will be inconsequential because the debt or assets thus accumulated will be finite, and, appropriately discounted, will not violate the relevant transversality (no Ponzi game) condition.

[xv] The firm's monopoly power also potentially decreases the real interest rate from its competitive level, the marginal product of capital. However, this effect is not included here as financial firms may, to a rough approximation, be thought of as equally monopolistic as product firms; thus, the monopoly power is equal on both sides of the financial market and balances out. Strictly speaking, the correct interpretation of the index μ is firm's relative monopoly power in the product market compared to the power that the firm enjoys in financial markets. We maintain the case of $\mu>0$ as more plausible.

[xvi] If we write the worker's utility as $U=U(C, L)=\log C-\beta L$, subject to the constraint $C=WL$, in obvious notation, with $W=(1-\mu)MPL$, then, the demand for labour is given implicitly by firm's optimisation by $W=(1-\mu)L^{\lambda-1}$, and the supply is given by the individual's FOC: $W/C=\beta$, so that $L=1/\beta$. Hence, equation (7) appears as a combination of the two. A rise in firm's monopoly power reduces both equilibrium employment and wage, while a rise in workers' power raises the wage and reduces employment. The former is (more or less) equivalent with a rise in μ, the latter with a rise in β.

[xvii] Additional effects of status on growth arise if one generalises the utility function to let status depend on the ratio of individual-to-average wealth, as in Tournemaine and Tsoukis (2008).

[xviii] More precisely, this change rotates the schedules around the origin in the manner shown. The same is true of all the changes considered. With this in mind, we use rather liberally the word shift.

[xix] This is valid under log-normality of X_K, otherwise it holds as an approximation.

[xx] Again, use is made of the log-normality of X_i, by which $E(X_i)=\exp\{Ex_i+\sigma^2_x/2\}$. Since $E(X_i)=1$, we have $Ex_i=-\sigma^2_x/2$. We also have, $E(1/X_i)=\exp\{-Ex_i+\sigma^2_x/2\}$, therefore $E(1/X_i)=\exp\{\sigma^2_x\}$.