Intergenerational Transmission of Inflation Aversion: Theory and Evidence

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Abstract

While there is a voluminous literature on short-run inflation dynamics, not much is known on what drives the long-run evolution of inflation preferences. To study this important issue, we develop an overlapping-generations framework with endogenous transmission of heterogeneous degrees of inflation aversion in response to social learning from past and own inflation experience. Preference transmission occurs via two channels, both viewed as forms of collective memory or cultural inheritance. The first channel, 'socialization', operates through the process whereby parents and peers affect the adoption of a given trait (degree of inflation aversion, in our case); the second channel, 'institutionalization', is enshrined in the evolving laws and institutions of a society (central bank independence, in our case). These channels are first examined analytically and in simulations. Empirical tests, employing a new measure of inflation aversion constructed from survey data, are then proposed that provide evidence in support of the theory.

Keywords: intergenerational transmission, endogenous preferences, inflation aversion, central bank independence, social learning, collective memory

JEL classification: D72, D83, E31, E58, H41, J10

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1 Introduction

Is low inflation here to stay? Competing theories may provide hints about the likely permanence of the contemporary low-inflation regime. Some would probably insist on the evolution of monetary institutions, more independent and more focused on price stability during the recent period of Great Moderation than in the last episode of Great Inflation (Crowe and Meade, 2007). Others have pointed to globalization as a weight on inflationary pressures (Gamber and Hung, 2001; Rogoff, 2003). More deeply rooted explanations of the worldwide trend toward low inflation are, however, needed.

While there is a voluminous literature on the dynamics of short-run inflation, not much is known on what drives inflation over long-run spans of time. In such a context, inflation preferences are fundamental, as their dynamics is shaping a nation's inflation prospects. One thus has to focus on social preferences with regard to the desirable inflation and explore their transmission from one generation to another. Along such lines, if part of an explanation would lie in the inflation experiences people have gone through within their own lifetime (Malmendier and Nagel, 2009), another part would reside in the 'inflation culture' (often referred to as 'stability culture') societies have built through history (Hayo, 1998; Hayo and Hefeker, 2002; Vaubel, 2003).

Whereas most of the literature in economics assumes preferences as 'priors' which are endowed to agents and do not change, a more promising route to understand the key determinants and the sustainability of the recent low-inflation regime is to look at preferences as shaped out by evolutionary and cultural forces in society. Dual inheritance theory in anthropology and other social sciences, treated at length in Cavalli-Sforza and Feldman (1981) and Boyd and Richerson (1985), suggests that genes (or 'nature') are not the only factor responsible in influencing traits and practices of individuals. Culture, defined in a general sense as imitative or social learning typical mostly for humans (and often dubbed 'nurture'), is the other crucial factor, whose importance may even be overwhelming. Indeed, based on experimental eliciting of preferences over giving and risk-taking from a subject pool of twins, Cesarini et al. (2009) estimate that only about 20% of individual variation is explained by genetic differences. Moreover, while it takes a large number of generations for genes to mutate, beliefs, values and behavior inherited as culture can be modified much faster, in a generation or two, as individuals and societies adapt in response to observation and experience.

In particular, when it comes to intergenerational transmission of socially-relevant attitudes such as inflation aversion, as in the present paper, the entire effect on the dynamics of preferences would most likely be due to culture, and not to genes. There is anthropological evidence that culture influences risk aversion (Henrich and McElreath, 2002) and judgement (Nisbett, 2003). And from an economist's point of view, it has been argued by Hayo (1998) that preferences for low inflation may have their roots in a nation's culture, while Dessí (2008) relates individual internalization of cultural norms and values to the quality of the existing institutions. Of course, culture, preferences and institutions are ultimately moulded by history, as relevant past experience – e.g., hyperinflationary episodes in the context here – is then transferred as collective memory to the next generations (Vaubel, 2003).[1] It would, thus, appear natural that, as Scheve (2004) reports,

[1] 'Collective memory' is a concept introduced by Halbwachs (1925), but mostly developed in social

there is significant cross-country variation in inflation aversion.

Based on such a departing hypothesis, we endogenize inflation aversion preferences as being culturally transmitted from one generation to another. This transmission occurs in our model through two channels, both constituting, essentially, the main channels to pass on collective memory, or cultural inheritance. The first channel, 'socialization', operates through the process whereby parents and peers affect the adoption of a given trait (degree of inflation aversion, in our case) depending on chance, socialization effort and, ultimately, learning from experience (materialized inflation, relative to the preceding generation).[2] The second channel, 'institutionalization', captures past learning evolving through history and enshrined in the laws and institutions (central bank independence, in our case) each generation 'bequests' to the next as 'social inheritance'. In implementing this approach, we follow Bisin and Verdier (2000, 2001) who build on the literature within economics on endogenous preferences[3] to develop and analyze formal set-ups where preferences evolve across generations. We here extend this framework to investigate how the intergenerational dynamics of inflation aversion is influenced by endogenous preference transmission in response to learning from past and own-generation inflation experience and the resulting collective memory.[4]

It may seem surprising that very few papers have examined the long-run stability of inflation aversion. In addition to the assumption of fixed preferences in theoretical models, this outcome probably also reflects a simple empirical trend: economists now generally admit that central bank independence (CBI hereafter) – embodied in laws and regulations in many countries over the last two decades – reveals a society's inflation aversion. From such a perspective, then, everything appears as if the world has evolved towards higher inflation aversion, evidenced by the rising number of central banks made independent or, for the ones which were already, by the increase in their degree of independence (Crowe and Meade, 2007; Arnone et al., 2009). Yet, though the trend has been towards more independence, we do not know whether a reversal would not occur in the future. Such a scenario is not unlikely, insofar central bank objectives and constraints may evolve, if only because legal attempts to restrict CBI can be rewarding for short-sighted politicians (Waller, 1991). Hence, this paper delves deeper by exploring the long-run drivers of inflation aversion.

The first part of the paper, section 2, analyzes the dynamics of inflation aversion preferences in an overlapping-generations (OLG) model with heterogenous mature agents characterized by different degrees of inflation aversion. Our theoretical contribution is to

science since the 1970s. It has been used across a wide spectrum of contexts. Mithander et al., eds., (2007) associate collective memory with how individuals, communities and nations have dealt with their past through remembrance, historiography and legal settlements.

[2]Note that it is parents who learn from experience in our context, and then – accordingly modulating preference transmission effort and voting – they socialize their offspring and amend institutions. Lizzeri and Siniscalchi (2008) take a different approach whereby it is children who learn under the supervision of parents. Their model has a different aim, capturing the trade-off between 'sheltering' the child from the consequences of his mistakes and allowing him to 'learn from experience'.

[3]Going back to Becker (1976), Hirshleifer (1977) and Rubin and Paul (1979); Becker (1996) is a widely cited book.

[4]For an early analysis of social learning and personality development in cognitive psychology, see, e.g., Bandura and Walters (1963); for a compact survey of learning models in economics, see, e.g., Sobel (2000).

demonstrate that in an extension of the set-up to a stochastic process for inflation implying learning from observed history and a resultant modulation of the exerted socialization effort, an irregular long-run cyclical pattern in the dynamics of social preferences may be generated. In the second part of the paper, section 3, we test empirically the key predictions derived from our model, which are broadly supported in our sample. Section 4 provides a concluding summary.

2 Theoretical Framework

We here build on the OLG set-up of Bisin and Verdier (2000, 2001), to extend and apply it to the long-run evolution of inflation aversion.

2.1 Preference Types and Monetary Institutions

A generation consists of a continuum of individuals, each living for two periods and having one offspring, so that the population is constant and the size of the mature generation is normalized to 1. We consider two types, $i \in \{a, b\}$, of preferences in the population defined on a private good c and a public good G, which we interpret narrowly as independence of the central bank. In the beginning of their mature life, spanning over a given period t, all individuals receive an identical time-invariant nominal (initial) endowment ϖ. Throughout (most of) t, they experience inflation, which affects the real value of their endowment, and socialize their children. At (or near) the end of t, they vote on the degree of CBI, pay the social cost of the enacted degree of CBI from their real endowment, consume the rest of it, and die.

We assume that preference types arise from differences in the structure of their otherwise equal nominal endowment (or portfolio of assets, in a broader sense). A (constant) fraction, $0 < \varphi < 1$, of the initial endowment of type b is not affected by inflation (e.g., indexed or otherwise protected against inflation) so that her real (final) endowment is $\varpi_t^b \equiv \varphi\varpi + \frac{(1-\varphi)\varpi}{1+\pi_t}$, with π_t denoting the (net) rate of low-frequency inflation (say, in % per annum as an average over a mature-generation life span t). Type a has no such (diversification or indexation) advantage and her real (final) endowment is simply $\varpi_t^a \equiv \frac{\varpi}{1+\pi_t}$.

Among other things, the long-run inflation we want to model could depend in part on its own history, and in part on the institutionalized degree of CBI, G_{t-1}^{i*}, as well as on some disturbance process, ε_t (e.g., a normal shock with mean μ_ε and variance σ_ε^2), i.e., $\pi_t = \pi\left(\pi_{t-1}, \pi_{t-2}, ...; G_{t-1}^{i*}; \varepsilon_t; \cdot\right)$. To keep the set-up as simple and general as possible and to focus on the issue of interest here, we assume that inflation is driven by a low-frequency first-order autoregressive (AR(1)) stochastic process with a CBI-related (or institutional) drift,

$$\pi_t = -G_{t-1}^{i*} + \rho\pi_{t-1} + \varepsilon_t, \qquad (1)$$

where $0 \leq G_{t-1}^{i*} \leq \mu_\varepsilon$ (or some other acceptable upper bound) switches between G_{t-1}^{a*} and G_{t-1}^{b*} whenever majorities shift in any period $t-1$. Our long-run inflation dynamics in (1) thus captures the related evidence discussed in the Introduction that the degree of CBI is negatively correlated with inflation. We further assume that all agents are aware of this link (although not necessarily of the precise inflation-generating process).[5] In effect, all agents value CBI, but each type prefers a different degree of CBI, which we show next.

Having experienced inflation, the mature generation decides each period t, via majority voting in parliament through proportional representation,[6] on the degree of CBI to be enforced henceforth. Following Bisin and Verdier (2000), we assume that each adult chooses the total amount of the public good, G_t, knowing that everyone in the society, irrespective of preference type, will have to contribute an equal share, $\frac{G_t}{1}$, towards the cost of providing the public good in the same period.[7] Since in our set-up the benefits of CBI[8] are explicitly captured by the final-period endowments, ϖ_t^i, and by the low-frequency inflation dynamics, equation (1), the choice is between different degrees of independence to legislate. Moreover, parents in the model are assumed to be altruistic to the next generation as a whole and myopic in the sense of 'imperfect empathy', as they 'bequest', via voting, their preferred degree of CBI that helps reduce inflation only in the next period. Like altruism to one's own child, imperfect empathy is a common assumption in the emerging socialization literature within economics. It implies that parents can perceive the welfare of their children only through the filter of their own preferences. In the present context, parents consider the benefits of their preferred degree of CBI desirable enough so that they feel a moral duty to bequest it.

An adult agent i's preferences are represented in an additively separable form,

$$u^i\left(c_t, G_t\right) = u^i\left(c_t\right) + \gamma_t^i v^i\left(G_t\right), \quad \text{with} \quad i \in \{a, b\} \text{ and } \gamma_t^i > 0,$$

where $u\left(c_t\right)$ and $v\left(G_t\right)$ are strictly concave, increasing functions satisfying $u'(0) = v'(0) = \infty$, and γ_t^i measures the relative weight of the utility from the public good.

A particular degree of CBI, G_t, entails at the same time a social cost, i.e., some function $G_t(\cdot)$. This is an aggregate cost to society which can come from several sources. One source of the cost – to which we limit our attention in this paper, modeling it in a quite general way – may come from the redistribution even moderate inflation induces within and across generations, with the losers being rich, old households, the major bondholders in the economy, while the winners are young, middle-class households with fixed-rate mortgage debt (Doepke and Schneider, 2006). Another source – which we do not model here – could be related to a distortion of the Phillips curve trade-off that causes the sacrifice ratio to increase at low levels of inflation (Akerlof et al., 1996; Benigno and Ricci, 2010).

Without loss of generality and following the huge literature on the provision of public goods, the social cost of CBI is hereafter expressed in terms of good c. If the fraction q_t^i, with $0 \leq q_t^i \leq 1$, of type $i \in \{a, b\}$ individuals at time t is more than a half, then $q_t^i > q_t^j$,

[5] We, thus, assume that CBI combines with conservatism to aim at, and achieve, low(er) inflation, reflecting the essence of most empirical findings so far. Yet CBI per se says nothing about what policy central banks should pursue, and has to be distinguished from conservatism.

[6] Modeling the political system is out of the scope of this article, and we refer the reader to Faust (1996), Bullard and Waller (2004) or Berentsen and Strub (2009).

[7] The literature on the private provision of public goods allows a less restrictive setting where each agent chooses his contribution, in units of the consumption good, and the resulting amount of the public good equals the sum of all contributions. We leave this avenue for future research.

[8] Many studies have strongly emphasized such benefits (Berger et al., 2001; Crowe and Meade, 2007), so we avoid their discussion here, to focus on our point.

and the voting equilibrium degree of CBI solves the maximization program of the type i (identical) agents

$$\max_{G_t^i} \quad u^i\left(c_t^i, G_t^i\right) \quad \text{s.t. } c_t^i + \frac{G_t^i}{1} \leq \varpi_t^i,$$

so that the corresponding unconstrained optimization problems by type can be written, respectively, as

$$\max_{G_t^a} \quad u^a\left(\frac{\varpi}{1+\pi_t} - G_t^a\right) + \gamma_t^a \upsilon^a\left(G_t^a\right),$$
$$\max_{G_t^b} \quad u^b\left[\varphi\varpi + \frac{(1-\varphi)\,\varpi}{1+\pi_t} - G_t^b\right] + \gamma_t^b \upsilon^b\left(G_t^b\right),$$

with FONCs:

$$u^{a\prime}\left(\frac{\varpi}{1+\pi_t} - G_t^{a*}\right) = \gamma_t^a \upsilon^{a\prime}\left(G_t^{a*}\right),$$
$$u^{b\prime}\left[\varphi\varpi + \frac{(1-\varphi)\,\varpi}{1+\pi_t} - G_t^{b*}\right] = \gamma_t^b \upsilon^{b\prime}\left(G_t^{b*}\right). \tag{2}$$

(2) implicitly defines the respective *optimal* social cost, $G_t^{a*}\left(\frac{\varpi}{1+\pi_t}, \gamma_t^a\right)$ and $G_t^{b*}\left[\varphi\varpi + \frac{(1-\varphi)\varpi}{1+\pi_t}, \gamma_t^b\right]$, and the corresponding *preferred* degree of CBI by type i agents in any period t. Plugging that optimal degree of CBI back into the utility yields the value function. For the type a agent, it is:

$$V^a\left(\frac{\varpi}{1+\pi_t}\right) \equiv \arg\max_{G_t^a} \quad u^a\left(\frac{\varpi}{1+\pi_t} - G_t^a\right) + \gamma_t^a \upsilon^a\left(G_t^a\right)$$
$$= u^a\left[\frac{\varpi}{1+\pi_t} - G_t^{a*}\left(\frac{\varpi}{1+\pi_t}, \gamma_t^a\right)\right] + \gamma_t^a \upsilon^a\left[G_t^{a*}\left(\frac{\varpi}{1+\pi_t}, \gamma_t^a\right)\right].$$

Because of the optimality of $G_t^{a*}(\cdot)$ and the positivity of $\gamma_t^a > 0$,

$$V^a\left(\frac{\varpi}{1+\pi_t}\right) > u^a\left(\frac{\varpi}{1+\pi_t}\right),$$

so that it is always in the interest of a type a mature agent to enjoy the public good, here her particular, preferred degree of CBI, $G_t^{a*}(\cdot)$.

Analogously, the value function of the type b agent becomes:

$$\begin{aligned} V^b\left[\varphi\varpi + \frac{(1-\varphi)\,\varpi}{1+\pi_t}\right] \quad &\equiv \quad \arg\max_{G_t^b} \quad u^b\left[\varphi\varpi + \frac{(1-\varphi)\,\varpi}{1+\pi_t} - G_t^b\right] + \gamma_t^b \upsilon^b\left(G_t^b\right) \\ &= \quad u^b\left\{\varphi\varpi + \frac{(1-\varphi)\,\varpi}{1+\pi_t} - G_t^{b*}\left[\varphi\varpi + \frac{(1-\varphi)\,\varpi}{1+\pi_t}, \gamma_t^b\right]\right\} \\ &\quad + \gamma_t^b \upsilon^b\left\{G_t^{b*}\left[\varphi\varpi + \frac{(1-\varphi)\,\varpi}{1+\pi_t}, \gamma_t^b\right]\right\}. \end{aligned}$$

Again, because of the optimality of $G_t^{b*}(\cdot)$ and the positivity of $\gamma_t^b > 0$,

$$V^b\left[\varphi\varpi + \frac{(1-\varphi)\varpi}{1+\pi_t}\right] > u^b\left[\varphi\varpi + \frac{(1-\varphi)\varpi}{1+\pi_t}\right],$$

so that it is always in the interest of a type b mature agent as well to enjoy the public good, here her particular, preferred degree of CBI, $G_t^{b*}(\cdot)$.

However, the *legal* degree of CBI each period is determined by the dominant type of agents' preferences via representation in parliament. Since under positive realizations of inflation, $\pi_t > 0$ (which is true most of the time for plausible parametrizations of (1), in particular with $\mu_\varepsilon > 0$),

$$\frac{\varpi}{1+\pi_t} < \varphi\varpi + \frac{(1-\varphi)\varpi}{1+\pi_t}$$

and, therefore,

$$G_t^{a*} > G_t^{b*},$$

then

$$u^{a\prime}\left(\frac{\varpi}{1+\pi_t} - G_t^{a*}\right) > u^{b\prime}\left[\varphi\varpi + \frac{(1-\varphi)\varpi}{1+\pi_t} - G_t^{b*}\right],$$

and

$$v^{a\prime}\left(G_t^{a*}\right) < v^{b\prime}\left(G_t^{b*}\right),$$

so that from (2), we have:

$$\gamma_t^a = \frac{u^{a\prime}\left(\frac{\varpi}{1+\pi_t} - G_t^{a*}\right)}{v^{a\prime}\left(G_t^{a*}\right)} > \frac{u^{b\prime}\left[\varphi\varpi + \frac{(1-\varphi)\varpi}{1+\pi_t} - G_t^{b*}\right]}{v^{b\prime}\left(G_t^{b*}\right)} = \gamma_t^b > 0. \tag{3}$$

Hence, the optimal degree of CBI for each type is shaped by the agent's endowment and the way she feels affected by inflation and the cost of CBI. If an agent feels that her net consumption possibilities, $\frac{\varpi}{1+\pi_t} - G_t^{a*}$ or $\varphi\varpi + \frac{(1-\varphi)\varpi}{1+\pi_t} - G_t^{b*}$, would be reduced too much relative to the other type under a higher degree of independence, her opposition to an increase in the degree of independence would be stronger. In other words, the higher the cost, the lower the optimal degree of independence to be accepted by both types – but the higher the gain from lower inflation of a's relative to b's (or, rather, their children): that is why, resulting from the FONCs, type a are more inflation-averse than type b in our model. Analytically, the marginal rates of substitution (MRS) of private good consumption for public good consumption across types implied by (3) differ, with type a's such MRS being higher (which is consistent with the higher degree of inflation aversion of this type) than type b's MRS for any t. Therefore the overall dynamics of the fraction of each type in the population will influence the intergenerational transmission of inflation aversion, by socialization and voting behavior each period, as we show in the next subsection.

Note from (3) that in our model the only socially optimal inflation rate that will not redistribute nominal endowments (or wealth, more generally) is zero. $\pi_t = 0$ makes the real endowments of both types equal to the nominal endowments, and thus eliminates the cause for the types being distinct. Any positive rate of inflation, $\pi_t > 0$, as we showed, harms both agent types, but a types more (relative to b types). Inversely, any negative rate of inflation, $\pi_t < 0$, benefits again both agent types, and again a types more (relative to b types). To anticipate on the empirical application provided further down, one can think of the active working-age population as type b who would support a lower degree of CBI than retirees, type a, e.g., because they seek protection of their pensions and (mostly fixed-income) savings from inflation (Gertler, 1999; Doepke and Schneider, 2006; Fujiwara and Teranishi, 2008).[9]

2.2 Deterministic Dynamics of Preference Transmission

To gain better insights into the model we outlined, we begin our analysis of inflation preference transmission across generations within a deterministic version of it, as in Bisin and Verdier (2000, 2001) and Sáez-Martí and Sjögren (2008) This amounts to abstracting, for some time, from the inflation equation (1) and the related institutionalization channel captured by voting on CBI, and focusing exclusively on the process of socialization, as we do next.

Children are born 'naive', i.e., with not well-defined preferences, but acquire them through observation, imitation and adoption of 'cultural models' with which they are matched. This matching, termed 'socialization', naturally comes in two steps and is influenced to some extent by economic choices, but also by parents. Children are first exposed to their parents model (type a or b), and are thus 'matched' with their family, in what can be termed 'direct vertical transmission'. If they do not adopt their parent's trait, they are then exposed to the influence of other individuals of the old generation (e.g., teachers, peers, role models) and adopt the preference type of some among these, i.e., 'oblique transmission'.[10] Recall that imperfect empathy, as a particular form of myopia we assumed throughout the paper, further implies that parents always want to socialize their children to their own preferences and cultural traits.

Exogenous Vertical Preference Transmission To examine the mechanism driving the intergenerational transmission of inflation aversion, the present subsection initially supposes that the child adopts his parent's preferences with a fixed (exogenous) probability τ^i, with $0 \leq \tau^i \leq 1$, $i \in \{a, b\}$. With probability $1 - \tau^i$, the child is matched randomly with another individual of the old generation and adopts her preference type.

The transition probabilities at time t, P_t^{ij}, that a parent of type i has a child adopting a preference of type j are then:

[9] Following minor adaptations, not pursued here, our model could accommodate alternative interpretations of types a versus b as lenders versus borrowers or effective opposition to inflation by the financial sector versus other interest groups (Posen, 1995). Observe as well that the Friedman (1969) rule of optimal (mild) deflation is generated by our model too, as it makes better-off both types in terms of real endowments (wealth, more generally) with a minimal redistribution cost. In fact, it is exactly such (high) social redistribution cost that may prevent the Friedman rule here from being violated, in the sense of running away into exploding deflation.

[10] This terminology originates in the anthropological and psychological literature, notably Cavalli-Sforza and Feldman (1981).

$$
\begin{aligned}
P_t^{aa} &= \tau^a + (1-\tau^a)\, q_t^a, \\
P_t^{ab} &= (1-\tau^a)\,(1-q_t^a), \\
P_t^{bb} &= \tau^b + \left(1-\tau^b\right) q_t^b = \tau^b + \left(1-\tau^b\right)(1-q_t^a), \\
P_t^{ba} &= \left(1-\tau^b\right)\left(1-q_t^b\right) = \left(1-\tau^b\right) q_t^a.
\end{aligned}
$$

Given these transition probabilities, the fraction q_t^a of adult individuals of type a in period $t+1$ evolves according to:

$$
\begin{aligned}
q_{t+1}^a &= q_t^a P_t^{aa} + q_t^b P_t^{ba} \\
&= q_t^a P_t^{aa} + (1-q_t^a)\, P_t^{ba} \\
&= q_t^a + q_t^a\,(1-q_t^a)\left(\tau^a - \tau^b\right) \\
&= \left[1 + (1-q_t^a)\left(\tau^a - \tau^b\right)\right] q_t^a.
\end{aligned}
$$

It is clear that the fraction of type-a agents in the old generation may stay constant across time only if the term in square brackets is equal to 1. This would occur if either (i) $q_t^a = 1$ or (ii) $\tau^a = \tau^b$ or (iii) both. However, case (i) – and, hence, case (iii) – is excluded by assumption for the initial condition ($0 < q_t^a < 1$), as otherwise a stable structure of the mature population's preferences emerges, in which the initial type of preferences perpetuates forever. Therefore, only case (ii) remains as a potentially relevant, symmetric option to consider; yet, it defines a steady state for any initial condition, without any evolution of the relative proportions of preferences in the society, and so is uninteresting for economic purposes.

In all other cases, different from (i), (ii) and (iii), the intergenerational dynamics of preferences depends on two factors: first, the proportion of type-a agents inherited from past history, q_t^a, relative to that of q_t^b; second, the *sign* of the difference of the vertical transmission probabilities, $\tau^a - \tau^b$, which determines the *direction* of preference convergence (toward type a or b). Writing the last-but-one line above as

$$
q_{t+1}^a = q_t^a + \left[q_t^a - (q_t^a)^2\right]\left(\tau^a - \tau^b\right) \tag{4}
$$

delivers a first-order non-linear sequence, which does not admit any general solution. However, given the assumptions on τ^a and τ^b, we know that the stability points of this function are 0 and 1.[11] The conditions for convergence are the following:

- If $\tau^a < \tau^b$, then for any initial condition q_0^a, $q_{t\to\infty}^a \to 0$: social preferences will converge towards an economy with only type-b agents, i.e., a lower degree of CBI.

[11] In this case, our exogenous transmission model is the logistic map. Let $\tau = \tau^a - \tau^b$; $x_t = \frac{\tau}{1+\tau} q_t^a$ and $r = 1+\tau$; then equation (4) becomes $x_{t+1} = r x_t\,(1-x_t)$. The logistic map is well understood (at least in the range $0 \le r \le 2$, which is implied by $0 \le \tau^i \le 1$): here, the known behaviour is equivalent to what we assert about the q_t^i processes.

- If $\tau^a > \tau^b$, then for any initial condition q_0^a, $q_{t\to\infty}^a \to 1$: social preferences will converge towards an economy with only type-a agents.

Since by the assumption of preference heterogeneity, $0 < q_0^a < 1$, no case can be ruled out, everything will depend on the relative size of τ^a and τ^b. To illustrate this result, we present phase diagrams for the two opposite cases. As can be seen in Figure 1, if the sign of the vertical preference transmission probability differential between types a and b, $\tau^a - \tau^b$, is positive, then the intergenerational dynamics of the fraction of preference type a converges to the steady state S with coordinates $(1, 1)$ for any initial condition q_0^a. The process is driven by the *concavity* of the phase diagram curves, drawn for different magnitudes of the mentioned probability differential. This leads to an ultimate adoption of type a agents' preferences – which is the only preference type to survive, while the other type is extinguished – implying perpetuation of the higher degree of CBI in this deterministic version of the model with exogenous vertical transmission. Conversely, Figure 2 shows that if the probability differential $\tau^a - \tau^b$ is negative, then the preferences of society converge to type b at the steady state S' with coordinates $(0, 0)$ for any initial condition q_0^a. The *convexity* of the phase diagram curves in this case directs convergence to an ultimate equilibrium where only type b survives, which results into perpetuation of the lower degree of CBI.

[Figures 1 and 2 about here]

Interestingly, the *speed* of the preference convergence process depends on (the absolute value of) the *magnitude* of the vertical preference transmission probability differential, itself determining the *curvature* of the path of the fraction of type-a preferences in our two phase diagrams. The larger (the modulus of) this differential (e.g., compare the graphs for 0.9 versus 0.1 in Figure 1 and for −0.9 versus −0.1 in Figure 2), the more curved the path and the quicker the convergence process.

Endogenous Vertical Preference Transmission Differently from the situations depicted in figures 1 and 2, real-world cultural heterogeneity does not seem to necessarily exhibit such convergence to an ultimate survival of one of the types, with the others extinguished (as in evolutionary selection mechanisms). Instead, an equilibrium where different types of preferences coexist would rather be sustained. Certain conditions on the transmission mechanism that induce heterogeneity in the long-run stationary distribution of preferences in the population have been examined by Bisin and Verdier (2001). However, in their set-up this analysis comes at the cost of imposing 'cultural substitution' (as in Sáez-Martí and Sjögren, 2008, too), which may be restrictive. Cultural substitution means that the vertical socialization of children *inside* the family and *outside* the family act as substitutes in the cultural transmission mechanism. Then, there can exist a heterogeneous distribution of preferences in the population which is globally stable. Intuitively, direct transmission acts as a cultural substitute for oblique transmission when parents have less incentives to socialize their children once their own values are widely dominant in the population.

For illustrative purposes, we can assume cultural substitution in the same way: the probability of direct vertical socialization to the parent's trait i, τ^i, will be a negative function of the attained level of the fraction in the population with that same trait, q_t^i, at time t; that is, we can write $\tau^i\left(q_t^i\right)$, with $\frac{d}{dq_t^i}\tau^i\left(q_t^i\right) < 0$. Then (4) becomes:

$$q_{t+1}^a = q_t^a + \left[q_t^a - \left(q_t^a\right)^2\right]\left[\tau^a\left(q_t^a\right) - \tau^b\left(1 - q_t^a\right)\right]. \tag{5}$$

In our context, equation (5) will have the same consequences as in the quoted papers, i.e., converging to an interior equilibrium. However, inflation aversion can more realistically be considered as a gradual outcome of past- and own-generation social experience and the lessons from it embodied in institutions. This leads us to address nondeterministic environments where learning from inflation experiences feeds collective memory.

2.3 Stochastic Dynamics of Preference Transmission

Allowing for a richer dynamics requires to endogenize the vertical transmission of preferences in a stochastic extension of the described set-up, also linking it with the low-frequency inflation dynamics equation (1) we introduced earlier. Combining features of the preceding subsections but keeping the model as straightforward as possible given our objective, and in line with similar mechanisms in the literatures on cultural transmission and social learning, we now incorporate into it several new features.[12]

First, we now assume that the probability of vertical socialization to the parent's trait i, τ_t^i, is a positive function of the effort at time t the parent exerts to socialize her offspring to her own trait, e_t^i: $\tau_t^i\left(e_t^i, \cdot\right)$, with $\frac{\partial}{\partial e_t^i}\tau_t^i\left(e_t^i, \cdot\right) > 0$. In other words, the more efforts a parent puts, the more efficient her transmission to the next generation.

Second, we assume that socialization efforts, e_t^i, are, in turn, a positive function of the severity of inflation (π_t) a particular generation has witnessed in its adult life span t relative to the inflation observed by the preceding generation (π_{t-1}), i.e., that of their parents. Thus, we write: $e_t^i\left(\pi_t - \pi_{t-1}, \cdot\right)$, with $\frac{\partial e_t^a(\pi_t - \pi_{t-1}, \cdot)}{\partial(\pi_t - \pi_{t-1})} > \frac{\partial e_t^b(\pi_t - \pi_{t-1}, \cdot)}{\partial(\pi_t - \pi_{t-1})} > 0$ if $\pi_t - \pi_{t-1} > 0$, while $\frac{\partial e_t^b(\pi_t - \pi_{t-1}, \cdot)}{\partial(\pi_t - \pi_{t-1})} > \frac{\partial e_t^a(\pi_t - \pi_{t-1}, \cdot)}{\partial(\pi_t - \pi_{t-1})} > 0$ if $\pi_t - \pi_{t-1} < 0$. That is, types a react more than types b in increasing their socialization efforts to accelerating inflation, while types b react stronger than types a in increasing efforts to decelerating inflation (since types b are less inflation-averse, they see a problem with a too high degree of CBI if inflation is anyway observed by their generation to be falling down). Accordingly, we now distinguish a second channel of transmitting collective memory – or cultural inheritance – by the old generation to the young: a behavioral (or educational) channel which is always operative through socialization, $e_t^i\left(\pi_t - \pi_{t-1}, \cdot\right)$, in addition to the institutional (or legal) channel which operates through voting, G_t^*, and, therefore, only when majorities shift.[13]

[12] Note that we consider further below immediately the endogenous case, where socialization responds to observed inflation given the legislated CBI. A theoretical exploration of the exogenous case under stochastic dynamics would imply to specify stochastic processes for the probabilities of vertical transmission (τ_t^i). Assuming them random variables, e.g., draws from uniform $(0, 1)$ independent distributions each period in the simplest context, would lead one to rewrite (4) as $q_{t+1}^a = q_t^a + \left[q_t^a - \left(q_t^a\right)^2\right]\left(\tau_t^a - \tau_t^b\right)$. Our simulations of this equation with stochastic τ_t^i's from different q_0^a generate ultimate convergence to either of the types, as in the deterministic exogenous case, within 20 to 100 periods depending on the particularly materialized sequences of $\tau_t^a - \tau_t^b$.

[13] In principle, both channels could have formal and informal ingredients, which we do not model.

Third, to simplify the simulations, we assume when performing them that $G_t^{*a} = G^{*a} = const > G^{*b} = G_t^{*b}$ in (1) and fix $G_t^{*a} = G^{*a} = 0.5G^{*b} = 0.5G_t^{*b} = -\pi_0$, with the initial condition for inflation being $\pi_0 = \mu_\varepsilon$. Our simplifications here imply that those of the alternative simulation cases where the mean of the inflation shock is assumed zero, $\mu_\varepsilon = 0$, eliminate (by construction in the codes) the drift term in the low-frequency AR(1) stochastic process for inflation as well as the feedback from the CBI (or institutional) channel.[14]

From these assumptions, we substitute back in equation (4), to obtain:

$$q_{t+1}^a = q_t^a + \left[q_t^a - (q_t^a)^2\right] \begin{pmatrix} \tau_t^a \left[e_t^a (\pi_t - \pi_{t-1}, \cdot), \cdot\right] \\ -\tau_t^b \left[e_t^b (\pi_t - \pi_{t-1}, \cdot), \cdot\right] \end{pmatrix}, \tag{6}$$

with $e_t^a (\pi_t - \pi_{t-1}, \cdot) > e_t^b (\pi_t - \pi_{t-1}, \cdot)$ whenever $\pi_t - \pi_{t-1} > 0$, and inversely in the opposite case.

Equations (1) and (6) thus form an interdependent recursive dynamic system in two state variables, π_t and q_{t+1}^a. Staring from some initial conditions π_0 and q_0^a, implying also a corresponding initial value for G_0^{i*}, the shock realization ε_1 gives π_1 from (1); from (6), then, $\pi_1 - \pi_0$, will first impact the socialization effort across types, next the preference transmission probabilities, and ultimately q_1^a; an so on and so forth in subsequent periods. This chain of effects constitutes the mechanism generating irregular cycles of temporary convergence towards one trait in the population or the other. For example, if in equation (6) past-period inflation (π_{t-1}) has been high (relative to π_{t-2}), socialization ($\tau_{t-1}^a \left[e_{t-1}^a (\pi_{t-1} - \pi_{t-2}, \cdot), \cdot\right]$) and voting ($G_{t-1}^*$) will have taken place in $t-1$, increasing the degree of inflation aversion (q_t^a) and, potentially (i.e., if the majority type has shifted), of CBI too (G_{t-1}^{a*}). The present-period adult generation in t may thus feel more insulated from the effects of high inflation via the increased CBI, and its effort ($e_t^a (\pi_t - \pi_{t-1}, \cdot)$) to socialize their own children (to stronger inflation aversion) will be reduced. A period of convergence away from the high inflation aversion the preceding generation had built (and potentially transformed in inflation-proof institutions) would then follow. Hence, preference shift cycles can arise and reverse each other, as illustrated next by a summary of our simulations.

To explore further this mechanism, we simulated our dynamic model embodied in the recursive system (1) and (6) over 100 periods under alternative parameters and shock processes.[15] Our benchmark simulations concerning inflation dynamics assumed, alternatively, 3 cases:

1. $\pi_0 = \mu_\varepsilon = 0$ and $\sigma_\varepsilon^2 = 1$, i.e., a zero-mean inflation regime, or one consistent with

[14] Exploring also $G_t^{*a} = G^{*a} = 0.5G^{*b} = 0.5G_t^{*b} = -\pi_0 = -\mu_\varepsilon = 0$ is done on purpose, as it allows direct comparison with the analogous simulation cases that differ only in that $G_t^{*a} = G^{*a} = 0.5G^{*b} = 0.5G_t^{*b} = -\pi_0 = -\mu_\varepsilon = 2$. Note that in the former case inflation becomes an AR(1) stochastic process without the institutional drift influence.

[15] To do so, we assume that low-frequency inflation is not forecastable, in the sense that our agents do not have a long record (say, 30 generations) of inflation history, so they cannot really infer, estimate and project the AR(1) process with a drift in a statistically credible way. In short, they do not know it precisely, and the same refers to the monetary authority, so both react only to what they have observed, that is, to $\pi_t - \pi_{t-1}$. The memory for the inflation process across generation spans t is, however, kept somewhat in the evolution of G_t^{i*} over time.

zero-inflation steady states in theoretical models;

2. $\pi_0 = \mu_\varepsilon = 2$ and $\sigma_\varepsilon^2 = 1$, i.e., a low-inflation regime, or one broadly typical for advanced economies over the most recent generation span; and

3. $\pi_0 = \mu_\varepsilon = 6$ and $\sigma_\varepsilon^2 = 3$ (all these 3 parameters 3 times higher than in case 2), i.e., a high-inflation regime with higher volatility, or one broadly typical for emerging markets over the most recent generation span.

Moreover, all 3 benchmark cases were simulated for 3 alternative (constant) values of the parameter measuring low-frequency inflation persistence,[16] $\rho = \{0.1, 0.5, 0.9\}$, and for 3 endogenous vertical probability differentials, $|\tau_t^a [e_t^a (\pi_t - \pi_{t-1}, \cdot), \cdot] - \tau_t^b [e_t^b (\pi_t - \pi_{t-1}, \cdot), \cdot]| = \{0.1, 0.2, 0.5\}$, translating the reaction to observed intergenerational inflation variation into corresponding socialization effort and, ultimately, probability differential of passing over the parent's trait to the child across the two types.[17] The magnitude of this differential is thus discretized in the simulations into 3 cases, namely: an absolute value of 0.1 (obtained as in footnote 17) captures the case of a low endogenous vertical probability differential, an absolute value of 0.2 (obtained analogously from probabilities of 0.6 and 0.4) accounts for an intermediate case, and an absolute value of 0.5 (obtained from probabilities of 0.75 and 0.25) features a high vertical probability differential. Figure 3 summarizes our most interesting results, and the mentioned cases are depicted in each of its three panels, respectively, for an underlying inflation process with $\pi_0 = \mu_\varepsilon = 2$ and $\sigma_\varepsilon^2 = 1$ (i.e., a low-inflation regime) and $q_0^a = 0.5+$.

[Figure 3 about here]

Our model simulations pointed to the following conclusions. First, whenever the resulting vertical transmission probability differential,

$$\left| \tau_t^a \left[e_t^a \left(\pi_t - \pi_{t-1}, \cdot \right), \cdot \right] - \tau_t^b \left[e_t^b \left(\pi_t - \pi_{t-1}, \cdot \right), \cdot \right] \right|,$$

is sufficiently high – of the order of 0.5 or more, convergence may take more than 75 or 100 (mature) generation spans but it ultimately most likely occurs to one of the types. This conclusion remains valid even when starting from an equal initial share in the population, $q_0^a = 0.5\pm$, depending on the sequences of materialized inflation shocks. Under the particular sample for the inflation process drawn and illustrated in the bottom-center and bottom-right graph of Figure 3, the ultimate convergence is to $q_t^a \to 1$, with type-b extinguished. This pattern, as well as the inverse one (as in the bottom-left graph)

[16] Note that in our context persistence of the inflation process at (mature) generation spans (t of the order of 25-30 years) may not necessarily correspond to measured short-run (annual or quarterly t) inflation persistence in the abundant literature. Also, $\rho \to 0$ captures a normal stochastic process for inflation, while with $\rho \to 1$ it approaches random walk behavior. Thus, while modeled and simulated as a stochastic AR(1) with drift, our low-frequency inflation dynamics is rather general though remaining simple.

[17] The simulations also assume a symmetric socialization effort by the two types, in the sense that, for example, when $\tau_t^a(\cdot) = 0.55$ and $\tau_t^b(\cdot) = 0.45$ after an observed increase in inflation, then $\tau_t^b(\cdot) = 0.55$ and $\tau_t^a(\cdot) = 0.45$ after an observed decrease in inflation: this results into the low endogenous vertical probability differential case (the top panel in Figure 3) where $\left| \tau_t^a \left[e_t^a \left(\pi_t - \pi_{t-1}, \cdot \right), \cdot \right] - \tau_t^b \left[e_t^b \left(\pi_t - \pi_{t-1}, \cdot \right), \cdot \right] \right| = 0.1$.

of ultimate convergence to $q_t^b \to 1$, with type-a extinguished, similarly occurred when simulating the purely stochastic exogenous τ_t^i's (as mentioned earlier in footnote 12). However, the convergence process is much slower in the case of endogenous τ_t^i's.

Second, the main insight from the simulations highlights the possibility of irregular preference shift cycles, manifested in a sequence of interior values for the fraction of types which does not converge to any of the two corner steady states, as illustrated in the top and middle panels of Figure 3. The conditions which lead to such dynamics are the following two: (i) the endogenous vertical probability differential should be relatively low (about or less than 0.1 or 0.2 in absolute value); and (ii) the initial fraction should be close to the mid-point, $q_0^a \approx q_0^b$. The second condition is all the more of interest as it allows reversals at irregular intervals in the voted degree of CBI too, that is, when the legal channel of transmitting collective memory is also operative, in addition to the behavioral channel picked up in the simulations by the preference cycles resulting from modulations in the socialization efforts. For that particular reason we illustrate the flavor of our simulation results selecting exactly the case of $q_0^a = 0.5+$ in Figure 3.

Hence, as the simulations confirmed, our endogenous preference transmission in a stochastic set-up provides an alternative to the assumption of cultural substitution, by explicitly modeling the response of parents in their socialization effort – and, potentially, also voting outcome – to the change in inflation they have observed. The extension of the framework along such lines appears realistic and insightful, mostly in the context of the interpretation we propose of passing on learning from experience into (inflation aversion) preferences via parental or peer guidance and into (monetary) institution-building via legislative or political switches.

To sum up, as our analysis and simulations suggest, endogenous preference transmission in a stochastic economic environment can be understood as a process of intergenerational social learning. In it, parent generations experience inflation and transmit their preferences (i.e., their degree of inflation aversion) and institutions (i.e., the corresponding degree of CBI they voted for) to children generations.

3 Empirical Evidence

The model we developed in the theoretical section highlights a key determinant of the long-run evolution of inflation aversion. It is the proportion (q_t^a) of more inflation-averse (type-a) agents relative to the proportion (q_t^b) of less inflation-averse (type-b) agents in the population. q_t^a and q_t^b evolve across generations driven by socialization efforts (e_t^a and e_t^b) of parents with respect to their children and by institutional amendments that constrain policies (when agents vote to implement their preferences, G_{t-1}^{a*} or G_{t-1}^{b*}). We showed that both these preference transmission channels, socialization and institutionalization, can be thought of as ultimately shaped out by past and own-generation experience with low-frequency inflation dynamics ($\pi_t - \pi_{t-1}$).

3.1 Measuring Inflation Aversion

Inflation aversion data spanning generation-long periods are not available. We thus have to resort to cross-section estimates in assessing the impact of the determinants of inflation aversion highlighted by our theory.

Our measure of inflation aversion is based on the International Social Survey Program (ISSP) conducted by the Inter-university Consortium for Political and Social Research, which collects nationally representative data in a way that is comparable across countries. We employ the 2006 wave of the survey on the role of government in society (Role of Government, wave IV, hereafter RoG IV). It provides us with a sample of 33 countries and a corresponding database containing answers to questionnaires from individuals. To measure inflation aversion, we rely on the following question (7b): *On the whole, do you think it should or should not be the government's responsibility to keep prices under control?* The six categories of answers proposed to the respondents are: 'definitely should be', 'probably should be', 'probably should not be', 'definitely should not be', 'can't choose' and 'no answer'.[18] We use hereafter the sum of the percentage shares of the first two categories as our new measure of a country's degree of inflation aversion employed in the regressions. We, in effect, have constructed a survey-based proxy of 'absolute' inflation aversion in the population, which is different from the few other measures one can find in the literature.[19]

[Table 1 about here]

Table 1 collects descriptive statistics concerning our measure of absolute inflation aversion. A striking finding is that all countries in the ISSP RoG IV sample are highly inflation-averse. On average, 86.4% of the respondents reply that governments should definitely or probably control prices. The countries are almost equally distributed in the three upper quartiles, with the standard deviation for the whole sample being 8.3, or 10% of the average, a significant degree of variation which deserves to be explained.

3.2 Explaining Inflation Aversion

As Shiller (1997) notes, even more important than the international differences in inflation aversion are the intergenerational ones. Since the 1960s, demographic changes have been tremendous, as a large generation of baby-boomers is now entering into its retirement period. Such an intergenerational preference shift could have remained unnoticeable except for the size of this aging group within the current adult generation, which has enabled baby-boomers to translate their preferences into policies (see, e.g., Farvaque et al., 2010,

[18] Unfortunately, the ISSP RoG 2006 (as well as earlier) surveys do not contain any questions regarding central banks. We, therefore, had to consider the government and the central bank (in each of the countries in our sample) as constituting the same public-sector macroeconomic – monetary, in particular – authority. While it is true that the intertemporal public-sector budget constraint would include both institutions as its aggregate (or consolidated) unit of relevance, we acknowledge the potential limitations of such an interpretation.

[19] Scheve (2004) and Jayadev (2006) have also analyzed data from the ISSP, but from the preceding wave (ISSP RoG III, run in 1996). They both made use of a measure of 'relative' inflation aversion, employing a different question, where respondents were asked if the government's priority should be to fight unemployment or inflation. Another available measure of inflation aversion is an index constructed by Krause and Méndez (2005) and employed in Krause and Méndez (2008) for 34 countries over a period of 24 years. Their index is also defined as a relative degree of inflation aversion, and it aims at revealing policymakers' preferences. It measures the weight a policymaker puts on inflation stabilization in an objective function optimized under short-term (i.e., business-cycle like) constraints.

for related evidence on the reduction in inflation). Thus, an obvious candidate to proxy type-a agents in our model is the share of retirees in the mature population, while the working age people could be our proxy for type-b agents in the mature population. We examined how retirees and workers responded to the ISSP 2006 RoG IV question 7b. Comparing the responses by these two categories of the adult generation confirmed that retirees are, generally across our sample, more inflation-averse than people of working age. Therefore, a first long-run determinant of the degree of inflation aversion in our cross-sectional empirical tests of the theory is the proportion of retirees in the population. As one check for robustness, we employ both the share of retirees (i.e., our proxy for q_t^a) and the ratio of the share of retirees to the share of working age population (q_t^a/q_t^b) in alternative specifications. These variables, to serve as the regressor of main interest, summarize the preference structure of the theoretical economy described above.[20]

In the model as well as in real life, evolving inflation aversion perceptions across generations can be translated, and should have been largely embodied, into the degree of CBI a nation has instituted at any particular period of its history. And here is where the key implications of our OLG set-up allow a test of the theory in the available ISSP RoG IV cross-section of 33 countries, representing regional and socioeconomic types from all over the world. Moreover, during the last two decades at least, granting more independence to the monetary authority from the government has been econometrically shown to bear strongly on inflation (see, among others, Brumm, 2002, and de Haan and Klomp, 2008). Following such theoretical and empirical results, we include in the control set an index of CBI. Since our data on inflation aversion is from 2006, we opt for the CBI index computed by Arnone et al. (2009) for 2003, the closest available year.

Yet, our cross-section also includes emerging markets. In these countries, studies on CBI have consistently shown that indexes based on legal aspects are not always statistically significant. To deal with this issue, the literature generally makes use of the turnover of central bankers (see, for example, Dreher et al., 2008). Employing such a proxy in our framework would however be orthogonal, since turnover ratios are by definition related to short-term issues.[21] Hence, to account for the fact that the rule of law is as important as the legal independence of the central bank, we include a measure of the protection of property rights, developed by the Heritage Foundation and now regularly considered as a reliable way to capture the respect for the law (see, for example, La Porta et al., 2004).

Finally, to proxy the central channel in our model which operates through the impact of past national experiences – in particular, with high inflation – transmitted through collective memory, we add to the regressors a dummy. It equals 1 when episodes of hyper- or high inflation have been known in the 20th century, using the classification in Fischer et al. (2002).

Consequently, our benchmark cross-section equation is of the form:

$$InflAvers_t = \alpha + \beta Retirees_t + \gamma HighInflDum_t + \delta CBI_t + \eta PropRs_t + \epsilon_t.$$

[20] A detailed description of our data and sources and key simulation results is to be found in the supplementary appendix further below. Simulation and estimation codes as well as related input and output files are available upon request.

[21] Nevertheless, robustness checks using such a measure found it not statistically significant in our sample (see below).

InflAvers is our measure of a nation's degree of (absolute) inflation aversion, and *Retirees* is the share of retirees in the population or – depending on the regression specification – the ratio of the share of retirees to the share of working age population. *HighInflDum* is the dummy representing past (high) inflation experiences, *CBI* is the CBI index, *PropRs* stands for the property rights index, and ϵ is the error term. The equation is estimated by weighted least squares (WLS). WLS is a natural choice since our ISSP 2006 RoG IV sample includes countries as small as Ireland or Slovenia and as big as the US, Japan or Russia, in terms of both population and real GDP (which we choose as our two alternative weighting vectors). In the regressions weighted by the population, we also controlled for the effect of the country being richer or poorer, by employing the real GDP per capita, $RGDPpc_t$, for 2004 (from the World Penn Tables 6.2, see Heston et al., 2006).

[Figure 4 about here]

We performed the usual diagnostics tests involving the residuals from the regressions. In particular, we experimented as well with OLS, and analyzed the residuals of both the OLS and WLS regressions. This is documented in Figure 4 for one of our main specifications (namely, 1.1 in Table 2 further down). It is clear from the OLS residual plot and histogram (upper panels in Figure 4) that the OLS residuals manifest heteroskedasticity as well as non-normality. Since large residuals were, roughly, inversely proportional to population size (evident also in the plots), we first conjectured that the heteroskedasticity we were dealing with was of such known form. This induced us to rely on WLS instead of OLS. While the WLS residuals still displayed heteroskedasticity, the Jarque-Bera test (see the bottom right histogram in Figure 4) could not reject their normality. However, the results from formal White tests for the presence of heteroskedasticity of unknown form were inconclusive with respect to both the OLS and WLS residuals in most of our various specifications. We therefore implemented further estimation with White correction for heteroskedasticity of unknown form in our WLS regressions under both alternative weighting schemes.

The benchmark results from our estimation are presented in Table 2. The weighting vector consists of the respective population by country, data for 2004 (from the World Penn Tables 6.2, see Heston et al., 2006).

[Table 2 about here]

To better capture the model's two degrees of inflation aversion in a compact form (type-a preferences relative to type-b preferences), regression 1.1 uses the ratio of the share of retirees to the share of workers as the key regressor of interest. The controls include real GDP per capita, the high inflation dummy, the CBI index, and the property rights index. All variables and the intercept are statistically significant: real GDP per capita at the 10% level, the property rights index at the 5% level, the remaining three regressors and the constant at the 1% level. Furthermore, all have signs in conformity with theoretical expectations, and the explanatory power of the regression is very high. Our theory is empirically corroborated, as the higher the share of retirees relative to the working age population, the higher is a country's inflation aversion. As expected, it turns out that historical experience with high inflation (our dummy) negatively impacts current inflation aversion. That is, high inflation in the past leads the contemporaneous generation to take steps (informal, through socialization of their children, and formal, through institution-building by voting) to avoid returning to such a damaging path.[22] Consequently, the current generation (their offspring) feels institutionally more protected from inflation, and their inflation aversion is reduced. This is confirmed as well by the negative sign of the CBI index coefficient, showing that higher CBI reduces a nation's inflation aversion. We again interpret this as agents feeling less threatened by inflation, and thus being less wary about it.[23]

To check for the potential joint importance of collective memory captured by the high inflation dummy with that enshrined in institutional arrangements such as the indexes for CBI or the rule of law, we interacted all possible combinations of these three regressors. We could not obtain statistical significance of such product terms most of the time, which we illustrate by the findings in regression 1.2. The justification for experimenting with these interaction terms in the regressions arises from the following causality, also implied by our theoretical model. If a country experiences high inflation, the degree of a society's inflation aversion will increase, as b-types (less inflation-averse) switch to a-types (more inflation-averse). I.e., up to this point, it is only the socialization channel of preference transmission that operates, and this channel is always effective. Once such changes in the structure of aggregate preferences surpass a particular critical mass, the median voter in the model, simple voting majority obtains: only now the institutionalization channel becomes effective, and if the a-types have not been able to enshrine legally their preferences in earlier generations, they do it at this point in time. The degree of CBI institutionalized by a-types then remains valid until the opposite change of majority, in case this happens (sooner or later) in the future. Meanwhile, this higher (type a preferred) degree of inflation aversion built-in into the current law acts also as an 'insurance device' against a dovish government/central bank, possibly decreasing the socialization effort of a-types.

One minor inconvenience of regressions 1.1 and 1.2 is that we cannot obtain a more precise, quantitative interpretation concerning the marginal effect of the more inflation-averse type (type-a, as per our theory) on the degree of a society's inflation aversion. To be able to judge about that, as well as to check robustness, we proceed to regression 1.3 by considering separately the shares of the retirees and the working age population, and not their ratio. This specification highlights two insightful results. First, it is the share of retirees that remains statistically significant in determining inflation aversion, but not the share of the working age population. This is not much surprising given the dynamics

[22] To check robustness, we also ran the regressions substituting the high inflation dummy of Fischer et al. (2002) with two alternative high inflation dummies. They were constructed as 2- and 3-digit recent 15-year average of inflation. Our estimates showed very similar results in terms of the statistical significance, signs and even magnitudes of the coefficients for all included variables (as those reported in Table 2).

[23] To address another limitation of our data arising from potential skepticism of private agents about the goverment stabilizing prices, we constructed an index of the degree of trust in the government, making use – for consistency – of survey responses collected from the same data source, the ISSP RoG 2006. We aggregated the % of the responses within the top two categories from question 17 in this survey: *In your opinion, about how many politicians in [Country] are involved in corruption?*, with the following possibilities: "almost none; a few; some; quite a lot; almost all; can't choose". We then ran regressions adding this government trust index to our explanatory variables in Table 2. The added measure of trust in the government did not appear as statistically significant.

of our preference transmission model as well as the demographic evolutions the world has known in the last decades. Second, we can now see that an increase of one percentage point in the share of retirees leads to an increase of almost half percentage point (to be precise, 42 basis points) in the degree of inflation aversion, *ceteris paribus*. This is a very strong marginal impact, much stronger than the comparable (being share-measured variables) marginal impact – in the opposite, negative direction – of the CBI index (of about −15 basis points). Regression 1.4 finally adds the same interaction term as in regression 1.2, which – again – is not significant.

To check robustness, we altered the weighting vector, using real GDP instead of population. In this second weighting scheme we also had to omit one of the controls in the first weighting scheme, namely, real GDP per capita, to avoid potential inference problems with the used weights. Insofar this variable showed up as significant, but with practically zero coefficient in the preceding set of results, such an omission does not weaken the estimation. Table 3 shows the results from the WLS implementation with real GDP weighting.

[Table 3 about here]

As can be seen from the table, the change in the weighting vector does not affect in any important way our findings, neither qualitatively nor quantitatively. Again, adding the interaction term for the combined effect of the high inflation dummy and the CBI index in specification 2.2 does not strengthen the regression output.

Specifications 2.3 and 2.4 in Table 3 confirm the two important findings of the analogous regressions, 1.3 and 1.4, in Table 2. First, the share of retirees remains statistically significant in determining inflation aversion, but not the share of the working age population. And, second, an increase of one percentage point in the share of retirees leads to an increase of (a bit higher or lower than) half percentage point in the degree of inflation aversion, *ceteris paribus*. Thus, the marginal impact of the share of retirees on the degree of a society's inflation aversion comes out as even slightly stronger in magnitude when using real GDP weights instead of population weights. Moreover, it also remains about three times higher (in absolute value) than the comparable (statistically significant) effect of the CBI index (of about −13 basis points).

[Tables 4, 5, 6 and 7 about here]

In further robustness checks, we ran a few modifications of our regressions 1.1 and 1.3, presented in tables 4, 5, 6 and 7. First, given our model assumption (supported by the dominant evidence) that actual inflation tends to be negatively correlated with CBI, one competing interpretation of the negative correlation between the CBI index and inflation aversion we robustly found could be that recent inflation and inflation aversion may be themselves positively correlated. Moreover, survey respondents may have the current inflation in mind, which could affect the measure of inflation aversion. In order to test such alternative interpretations, we replaced the CBI index with recent average inflation, measured as the mean annual rate of CPI inflation in the five-year period up to and including 2006, the year of the wave (IV) of the ISSP RoG we are working with. Intuitively, the respondents could have been less inflation-averse if inflation has recently (in the run-up to the survey year) been low. The recent average inflation rate, however, came out robustly as not statistically significant, which excludes the possible alternative interpretation and reinforces the one we proposed above. Second, as we saw, the high inflation dummy is not significant in many of the various specifications where the CBI index always enters as well, and in the specifications with their interaction term. To see to what extent the statistical significance of the CBI index throughout our regressions may have occasionally invalidated the statistical significance of the high inflation dummy in separation (and/or of their interaction term), we ran regressions 1.1 and 1.3 with including, alternatively, either the high inflation dummy without the CBI index or vice versa, under our two weighting schemes: see again the reported sensitivity analysis in tables 4, 5, 6 and 7. Both variables were statistically significant and had the right negative sign in (almost) all occasions when each entered the regressions without the other one. This suggests the presence of the two channels we posited in the theoretical part, in the sense that inclusion of the (always significant) CBI index reduces the significance level of the high inflation dummy. Our empirical finding of these two particular regressors being correlated confirms our theoretical set-up: namely, past experience with high inflation matters, as it leads to higher inflation aversion and, hence, higher CBI, with the ultimate result in our data that both regressors could potentially explain inflation aversion.[24]

4 Conclusion

In this paper we address the question of what drives the long-run evolution of inflation preferences. To do so, we extend the OLG framework of Bisin and Verdier (2000, 2001), appropriate to study endogenous transmission of traits or beliefs across generations. We, in effect, adapt their set-up to explore endogenously derived and transmitted inflation aversion, dropping the assumption of cultural substitution and replacing the deterministic model with a dynamic-stochastic environment. In the simplest cases, also examined in the earlier literature, where the vertical transmission probabilities are either (i) exogenously fixed or (ii) endogenous but deterministic, there is a clear ‘separation’ of results. In the first case, only one of the types survives while the other is extinguished, and convergence depends on what we referred to as the direction and the speed of changes in the structure of the population. In the second case, convergence to an interior equilibrium with both types surviving is achieved at the cost of assuming cultural substitution. Our theoretical contribution is to show that, if the vertical transmission probabilities are a function of parent socialization efforts in response to observed changes in inflation between successive generations, our model generates much richer dynamics. It is characterized by switching majorities and phases of high and low degree of inflation aversion in the population fluctuating around an interior equilibrium for long, or forever (depending on initial conditions and the properties of the assumed shock processes).

We then propose appropriate empirical tests of our theory, making use of a novel, own measure of a nation’s inflation aversion in the population constructed out of survey data. We report robust cross-section evidence that a country’s demographic structure, in

[24] Further analysis of our empirical results in the light of our inflation aversion measure by region of the world are provided in the supplementary appendix.

particular the variation in the share of retirees (our proxy for the more inflation-averse type, as our model and data suggested) or of their ratio to the share of workers (our proxy for the less inflation-averse type), is a key driver of social preferences with regard to inflation. The presented regressions also confirm the importance of two other major long-run determinants of inflation aversion consistent with our model, namely, experience with past high inflation and the degree of CBI embodied in monetary institutions. Our econometric findings, thus, broadly support the theory and the simulation results, notably stressing how fundamental it is to understand the mechanisms behind the intergenerational transmission of individual preferences.

The model could be extended in several directions. On the theoretical side, allowing for population growth, alternative endogenous types and/or higher heterogeneity of traits could provide valuable insights, as well as the examination of different processes guiding low-frequency inflation dynamics. On the empirical side, another implementation compatible with slight modifications of the theory we proposed would be to consider how the evolution of the proportions of net savers and borrowers in an economy can influence its degree of inflation aversion, provided data become available on a comparable cross-country basis.

inflation aversion	mean	median	max	min	quant.	s. d.	skew.	kurt.	obs.
[60, 70)	0.674	0.674	0.674	0.674	0.674	–	–	–	1
[70, 80)	0.770	0.773	0.796	0.702	0.773	0.027	-1.96	5.83	9
[80, 90)	0.860	0.865	0.897	0.825	0.865	0.025	0.01	1.90	10
[90, 100)	0.946	0.937	0.980	0.910	0.937	0.023	0.07	1.54	13
all	0.864	0.870	0.980	0.674	0.870	0.083	-0.41	2.23	33

Table 1: Inflation Aversion – Descriptive Statistics by Quantile

Source: Authors' calculations based on ISSP 2006 RoG IV.

Regression	1.1	1.2	1.3	1.4
intercept	1.1090***	1.0531***	0.9687***	1.0490***
	(0.0000)	(0.0000)	(0.0012)	(0.0048)
retirees/workers	0.3007***	0.3223***	–	–
	(0.0012)	(0.0002)	–	–
retirees share	–	–	0.4157***	0.4654**
	–	–	(0.0083)	(0.0168)
workers share	–	–	0.2146	0.0187
	–	–	(0.6079)	(0.9748)
real GDP pc	$-2.81 \cdot 10^{-6}$*	$-4.89 \cdot 10^{-6}$**	$-3.55 \cdot 10^{-6}$	$-4.82 \cdot 10^{-6}$**
	(0.0650)	(0.0418)	(0.1326)	(0.0378)
high inflation dummy	–0.0336***	0.0644	–0.0441**	0.0473
	(0.0009)	(0.3344)	(0.0299)	(0.6874)
CBI index	–0.1524***	–0.1144***	–0.1542***	–0.1234**
	(0.0028)	(0.0091)	(0.0031)	(0.0226)
property rights index	-0.1868**	-0.0696	-0.1522	-0.0724
	(0.0364)	(0.6165)	(0.1909)	(0.5728)
CBI × high inflation	–	-0.1537	–	-0.1312
	–	(0.1596)	–	(0.4124)
adjusted R^2	0.9342	0.9386	0.9344	0.9353
F-statistic p-value	0.0000	0.0000	0.0000	0.0000

Table 2: Determinants of Inflation Aversion – Population-WLS Estimates

Note: Coefficients estimated by WLS using 2004 population weights from Heston et al. (2006) for:

$$InflAvers_t = \alpha + \beta Retirees_t + \lambda RGDPpc_t + \gamma HighInflDum_t + \delta CBI_t + \eta PropRs_t + \epsilon_t.$$

* denotes significance at the 10%, ** at the 5% and *** at the 1% level.

White correction for heteroskedasticity of unknown form applied.

Regression	2.1	2.2	2.3	2.4
intercept	1.0884***	1.1479***	1.2496*	1.1571
	(0.0000)	(0.0000)	(0.0523)	(0.1195)
retirees/workers	0.3946***	0.3132*	–	–
	(0.0001)	(0.0746)	–	–
retirees share	–	–	0.5708***	0.4596*
	–	–	(0.0000)	(0.0684)
workers share	–	–	–0.2294	–0.0089
	–	–	(0.7982)	(0.9941)
high inflation dummy	–0.0186	–0.1043	–0.0178	–0.1129
	(0.1635)	(0.3395)	(0.1745)	(0.5305)
CBI index	–0.1378***	–0.1501***	–0.1355*	–0.1590
	(0.0092)	(0.0071)	(0.0952)	(0.1530)
property rights index	–0.3179***	–0.3573***	–0.3255***	–0.3525***
	(0.0000)	(0.0001)	(0.0007)	(0.0000)
CBI × high inflation	–	–0.1134	–	0.1256
	–	(0.4347)	–	(0.5990)
adjusted R^2	0.8962	0.8960	0.8913	0.8911
F-statistic p-value	0.0000	0.0000	0.0000	0.0000

Table 3: Determinants of Inflation Aversion – Real GDP-WLS Estimates

Note: Coefficients estimated by WLS using 2004 real GDP weights from Heston et al. (2006) for:

$InflAvers_t = \alpha + \beta Retirees_t + \gamma HighInflDum_t + \delta CBI_t + \eta PropRs_t + \epsilon_t$.

* denotes significance at the 10%, ** at the 5% and *** at the 1% level.

White correction for heteroskedasticity of unknown form applied.

REGRESSION	1.1.A	1.1.B	1.1.C
intercept	0.9768***	1.0559***	1.0976***
	(0.0000)	(0.0000)	(0.0000)
retirees/workers	0.5599***	0.4317***	0.2216**
	(0.0004)	(0.0004)	(0.0128)
real GDP pc	$-4.02\cdot10^{-6}$*	$-2.23\cdot10^{-6}$	$-2.92\cdot10^{-6}$**
	(0.0289)	(0.2189)	(0.0767)
high inflation dummy	–0.0861***	–0.0503***	–
	(0.0047)	(0.0049)	–
CBI index	–	–	–0.1803***
	–	–	(0.0013)
property rights index	–0.1856*	–0.3071***	–0.1292
	(0.0690)	(0.0016)	(0.1448)
recent inflation	0.0065*	–	–
	(0.0789)	–	–
adjusted R^2	0.9103	0.9007	0.9234
F-statistic p-value	0.0000	0.0000	0.0000

Table 4: Determinants of Inflation Aversion – Sensitivity Checks on Regression 1.1

Note: Coefficients estimated by WLS using 2004 population weights from Heston et al. (2006) for:

$$InflAvers_t = \alpha + \beta Retirees_t + \lambda RGDPpc_t + \gamma HighInflDum_t + \delta CBI_t + \eta PropRs_t + \kappa RInfl_t + \epsilon_t.$$

* denotes significance at the 10%, ** at the 5% and *** at the 1% level.

White correction for heteroskedasticity of unknown form applied.

Regression	1.3.A	1.3.B	1.3.C
intercept	0.9473**	0.9070**	1.1791***
	(0.0181)	(0.0154)	(0.0001)
retirees share	0.7898**	0.6028***	0.3528*
	(0.0112)	(0.0073)	(0.0861)
workers share	0.0586	0.2266	-0.1233
	(0.9249)	(0.6778)	(0.7518)
real GDP pc	$-4.24{\cdot}10^{-6}$*	$-3.08{\cdot}10^{-6}$	$-2.71{\cdot}10^{-6}$
	(0.0937)	(0.2674)	(0.2992)
high inflation dummy	–0.0875**	–0.0622***	–
	(0.0165)	(0.0346)	–
CBI index	–	–	–0.1806***
	–	–	(0.0021)
property rights index	–0.1782	–0.2676**	–0.1398
	(0.1241)	(0.0430)	(0.3463)
recent inflation	0.0056	–	–
	(0.2007)	–	–
adjusted R^2	0.9037	0.8981	0.9207
F-statistic p-value	0.0000	0.0000	0.0000

Table 5: Determinants of Inflation Aversion – Sensitivity Checks on Regression 1.3

Note: Coefficients estimated by WLS using 2004 population weights from Heston et al. (2006) for:

$$InflAvers_t = \alpha + \beta Retirees_t + \lambda RGDPpc_t + \gamma HighInflDum_t + \delta CBI_t + \eta PropRs_t + \kappa RInfl_t + \epsilon_t.$$

* denotes significance at the 10%, ** at the 5% and *** at the 1% level.

White correction for heteroskedasticity of unknown form applied.

Regression	2.1.A	2.1.B	2.1.C
intercept	1.0725***	1.0550***	1.0856***
	(0.0000)	(0.0000)	(0.0000)
retirees/workers	0.4389	0.4741***	0.3657**
	(0.1539)	(0.0003)	(0.0000)
high inflation dummy	–0.0861	–0.0414***	–
	(0.1670)	(0.0023)	–
CBI index	–	–	–0.1592***
	–	–	(0.0000)
property rights index	–0.4209***	–0.4118***	–0.2916
	(0.0000)	(0.0000)	(0.0000)
recent inflation	–0.0011	–	–
	(0.8661)	–	–
adjusted R^2	0.8593	0.8639	0.8953
F-statistic p-value	0.0000	0.0000	0.0000

Table 6: Determinants of Inflation Aversion – Sensitivity Checks on Regression 2.1

Note: Coefficients estimated by WLS using 2004 real GDP weights from Heston et al. (2006) for:

$InflAvers_t = \alpha + \beta Retirees_t + \gamma HighInflDum_t + \delta CBI_t + \eta PropRs_t + \kappa RInfl_t + \epsilon_t.$

* denotes significance at the 10%, ** at the 5% and *** at the 1% level.

White correction for heteroskedasticity of unknown form applied.

Regression	2.3.A	2.3.B	2.3.C
intercept	1.7201**	1.7145***	1.2419*
	(0.0197)	(0.0095)	(0.0501)
retirees share	0.5933	0.5727***	0.5304***
	(0.1988)	(0.0092)	(0.0000)
workers share	–0.9224	–0.9041	–0.2217
	(0.4183)	(0.3053)	(0.8025)
high inflation dummy	–0.0355	–0.0341**	–
	(0.1600)	(0.0344)	–
CBI index	–	–	–0.1557**
	–	–	(0.0349)
property rights index	–0.4493***	–0.4525***	–0.3005***
	(0.0000)	(0.0000)	(0.0008)
recent inflation	0.0005	–	–
	(0.9568)	–	–
adjusted R^2	0.8637	0.8685	0.8908
F-statistic p-value	0.0000	0.0000	0.0000

Table 7: Determinants of Inflation Aversion – Sensitivity Checks on Regression 2.3

Note: Coefficients estimated by WLS using 2004 real GDP weights from Heston et al. (2006) for:

$InflAvers_t = \alpha + \beta Retirees_t + \gamma HighInflDum_t + \delta CBI_t + \eta PropRs_t + \kappa RInfl_t + \epsilon_t$.

* denotes significance at the 10%, ** at the 5% and *** at the 1% level.

White correction for heteroskedasticity of unknown form applied.

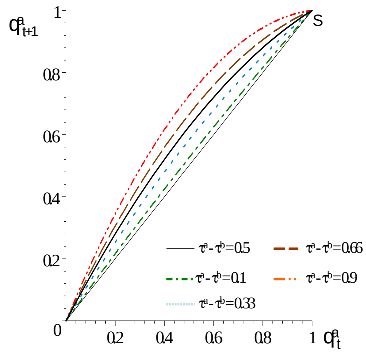

Figure 1: Deterministic Exogenous Convergence to Type-a Preferences

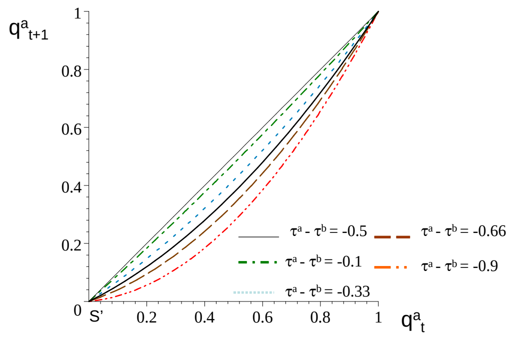

Figure 2: Deterministic Exogenous Convergence to Type-b Preferences

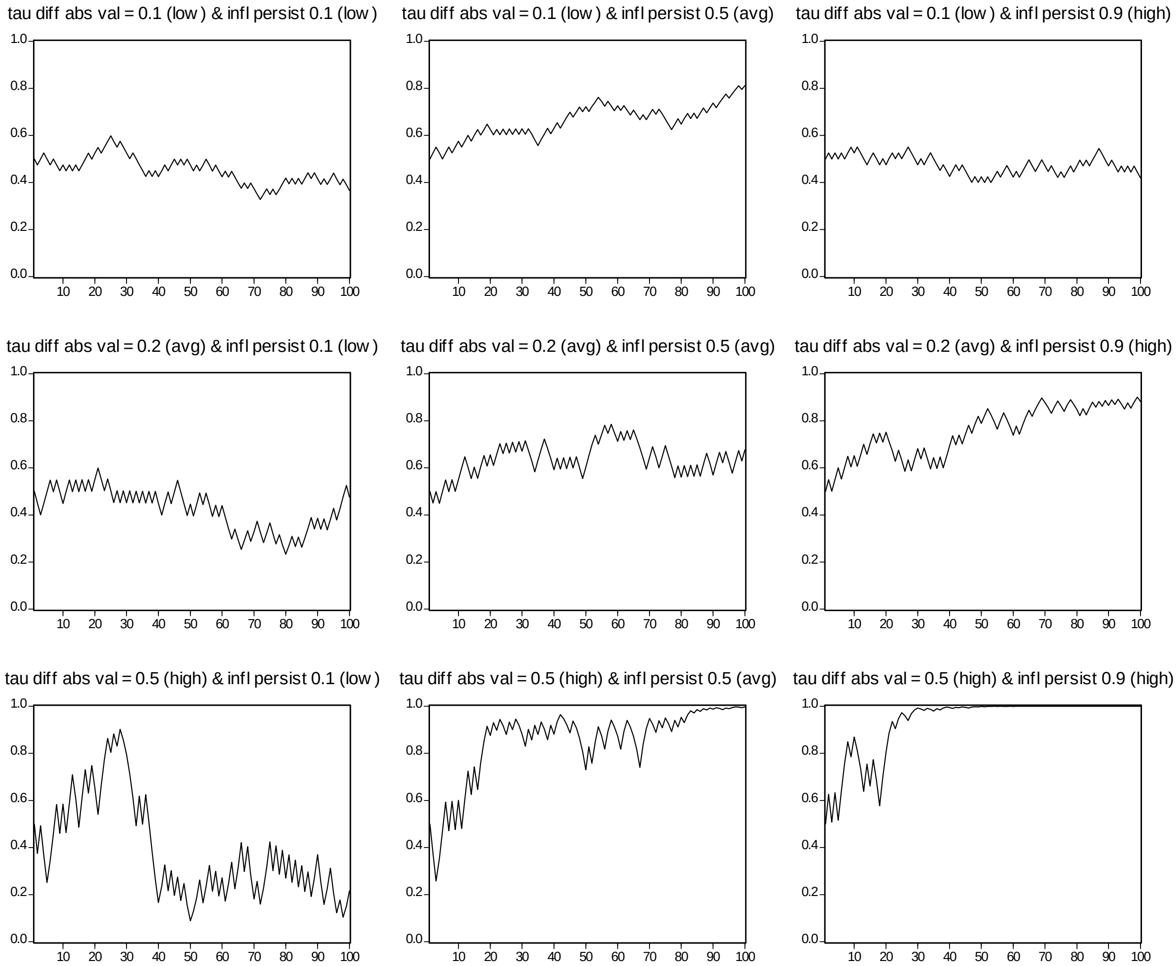

Figure 3: Stochastic Endogenous Dynamics of Type-a Preferences (left scales) with Symmetric Socialization Effort Responding to Observed Inflation Variation – Simulation Summary (for more details on our simulations and for interpretation of the above panels, see the discussion in subsection 2.3 and section 3 of the online supplementary material)

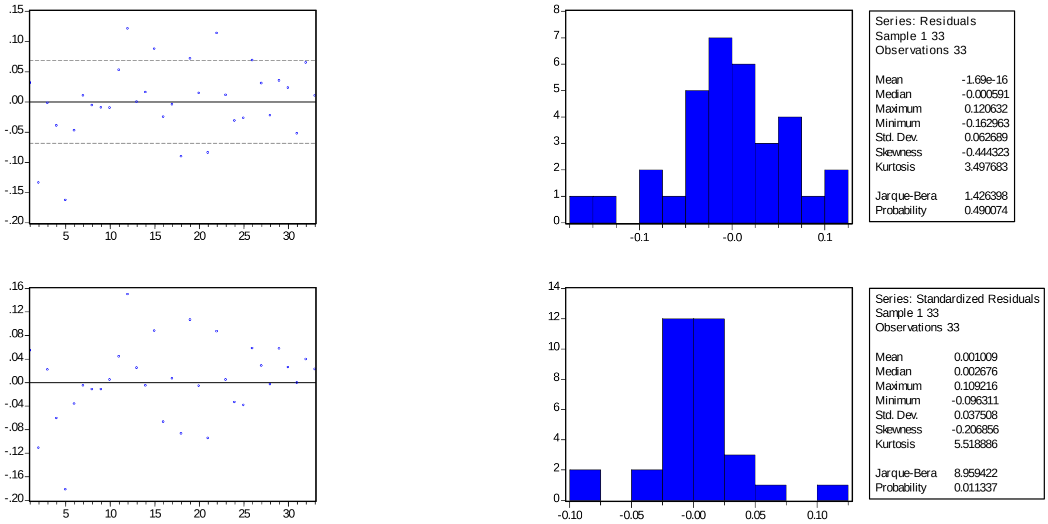

Figure 4: Regression Residuals Analysis – Heteroskedasticity of Residuals from OLS (top left panel) and from WLS (bottom left panel): countries in the sample on the x-axis (1 to 33) in ascending order of population; and Normality of Residuals from OLS (top right panel) and from WLS (bottom right panel)

This supplementary appendix provides further details on aspects of our novel measure of inflation aversion (section A), our data sources and definitions (section B) and our simulations (section C). For replication purposes, an additional zip file archive available upon request contains our data set, codes and the respective input and output files.

A Survey-Based Inflation Aversion Index by Region

Putting the empirical results we reported in the article in a regional perspective is another worthwhile way to cross-check their relevance. Table 8 here below organizes our survey-based measure of absolute inflation aversion by region of the world.[25]

inflation aversion									
ADVANCED ECONOMIES (17 COUNTRIES)									
European EMU (7)	FI	FR	DE	IE	NL	PT	ES		
mean: 0.857 (s.d.: 0.076)	0.786	0.828	0.783	0.930	0.796	0.963	0.910		
European non-EMU (5)	DK	NO	SE	CH	GB				
mean: 0.823 (s.d.: 0.053)	0.773	0.895	0.825	0.772	0.852				
non-European (5)	AU	CA	JP	NZ	US				
mean: 0.806 (s.d.: 0.088)	0.868	0.702	0.923	0.769	0.770				
EMERGING MARKET ECONOMIES (16 COUNTRIES)									
European (7)	HR	CZ	HU	LV	PO	RU	SI		
mean: 0.839 (s.d.: 0.094)	0.870	0.674	0.870	0.836	0.780	0.980	0.861		
non-European (9)	CL	DO	IL	KR	PH	ZA	TW	UY	VE
mean: 0.943 (s.d.: 0.026)	0.930	0.967	0.897	0.967	0.958	0.931	0.974	0.923	0.937

Source: Authors' calculations based on ISSP 2006 RoG IV.

Table 8: Inflation Aversion – Descriptive Statistics by Country Groups

First, it appears that countries belonging to the European Monetary Union (EMU) share a higher degree of inflation aversion than the rest of the sample and, interestingly, that this degree is higher than for countries that belong to the European Union (EU), but are not members of the EMU.[26] This tends to show that the adoption of a high degree

[25] Country codes as in the International Social Survey Program (ISSP) on the role of government in society (Role of Government, wave IV), namely: AU: Australia, CA: Canada, CH: Switzerland, CL: Chile, CZ: Czech Republic, DE: Germany, DK: Denmark, DO: Dominican Republic, ES: Spain, FI: Finland, FR: France, GB: Great Britain, HR: Croatia, HU: Hungary, IE: Ireland, IL: Israel, JP: Japan, KR: Korea, LV: Latvia, NL: Netherlands, NO: Norway, NZ: New Zealand, PH: Philippines, PO: Poland, PT: Portugal, RU: Russia, SE: Sweden, SI: Slovenia, TW: Taiwan, US: United States, UY: Uruguay, VE: Venezuela, ZA: South Africa.

[26] We should be cautious with such interpretations in so far as central bank independence (CBI) in accession countries is not just a matter of social preferences. It is also, or rather, a prerequisite for joining the EMU (and hence the EU as well). Thus being part of the 'acquis communautaire', CBI does not reflect just national preferences in the accession countries (unless one makes the argument that countries would abstain from joining EU in order not to be forced to make their central banks independent).

of independence for the European Central Bank probably has not yet infused the whole population. That institutions do not have immediate impacts, but may need time to establish their credentials, is again in agreement with our model. This latter claim is also confirmed by comparing the inflation aversion levels in Germany and in Russia. Though both countries have suffered from hyperinflation, Germany has since had time to build inflation averse institutions (notably the Bundesbank, before joining the EMU), while Russia's central bank has still not been granted full independence from the government.

Second, and even more interesting is the high degree of inflation aversion in emerging market economies, and particularly among the non-European ones (94.3%), especially once one remarks that the regions where inflation aversion is the highest in our sample are also the ones with the lowest standard deviation. The high level of inflation aversion in these economies can be related to their chronic inflationary experience but weak institutions.

Third, the Czech Republic has the lowest level of inflation aversion in our sample. This can notably be explained by the strong degree of central bank independence of its central bank (0.88, superior to the sample average of 0.72), reinforced over the last decade by the adoption of inflation-forecast targeting. Moreover, most of the countries that have in the past generation span implemented such an inflation targeting regime manifest lower levels of inflation aversion (in addition to the Czech Republic, that is the case for Canada, New Zealand, Poland, Sweden, United Kingdom). This tends to show that inflation targeting can back the more institutionalized degree of CBI.[27]

To sum up, in our view this additional analysis of our measure of (absolute) inflation aversion by region summarized above are largely supportive of the model predictions in the article too. They broadly confirm that the underlying evolution of a society's preferences is fundamental to observed macroeconomic trends such as, in our case, cross-sectional inflation aversion variation. They also seem to suggest that individuals may vary their socialization efforts to transmit their preferences, depending on the historical and institutional context of learning experience, building up into collective memory, and the ensuing relative incentives they have to face.

B Data Sources and Definitions

- **Degree of Inflation Aversion**
  - *Source:* International Social Survey Program (ISSP) on the role of government in society (Role of Government, wave IV) conducted by the Inter-university Consortium for Political and Social Research in 2006 for 33 participating countries.
  - *Definition:* authors' computations, summing up the percentage shares of responses falling in the first two categories of answers (*highlighted in Italics* among the enumerated below) to the following question (7b):

[27] The exceptions (i.e., inflation targeters that show slightly higher degrees of inflation aversion) are Australia and Hungary. Both countries have, however, recently known episodes of strong growth, for the former, or political instability, for the latter, which may have re-ignited inflation scares among the population.

    * 'On the whole, do you think it should or should not be the government's responsibility to keep prices under control?'
    * the potential answers proposed to the respondents are:
        · '*definitely should be*';
        · '*probably should be*';
        · 'probably should not be';
    * 'definitely should not be';
        · 'can't choose';
        · 'no answer'.

- **Demography**
  - *Source:* World Bank, *World Development Indicators* (annual series by country: April 2008 and June 2009 issues, accessed via ESDS), for the year 2006; *except for Taiwan* (see below); World Bank staff estimates from various sources including census reports, the United Nations Population Division's World Population Prospects, national statistical offices, household surveys conducted by national agencies, and Macro International.
  - *Definitions:*
    * **population, total** (SP.POP.TOTL);
    * **share of retirees:** Population ages 65 or older (% of older, SP.POP.65 UP.TO.ZS);
    * **share of working age population:** Population ages 15-64 (% of total, SP.POP.1564.TO.ZS).
  - *Source for Taiwan*: authors' computations of the above shares in the total population based on disaggregated data for the year 2000 by age groups from the National Statistics Republic of China (Taiwan); www.eng.stat.gov.tw.

- **Institutions**
  - *Sources:*
    * **central bank independence (CBI) index:** from Arnone et al. (2009), for the year 2003; except for Taiwan: from Ahsan et al. (2008), for the late 2000s;
    * **property rights index:** from The Heritage Foundation, for the year 2009; www.heritage.org;
    * **high inflation dummy:** authors' coding in conformity with Fischer et al. (2002).

- **Macroeconomic Data**
  - *Source: Penn World Table Version 6.2* – see Heston et al. (2006); for the year 2004.

* **population**;
* **real GDP per capita**, in PPP-USD;
* **real GDP**, in PPP-USD**:** authors' computations multiplying the above two numbers.

C Illustrative Summary of Simulations

We propose, finally, an illustrative summary of our simulations, described briefly in section 2.3 of our article. The summary here only collects a subset of figures capturing 9 key cases of cyclical variation around interior equilibria of the fraction of the more inflation-averse type (type a) over a time horizon of 100 periods (equal to adult-life generation spans, as per our model). All these 9 cases are characterized by *low* (and constant, in the simulations) *endogenous* (that is, responding to relative inflation, as discussed in section 2.3 of the paper) vertical inflation differential, i.e., $\left|\tau^a - \tau^b\right| = 0.1$. As we explained in the mentioned section, this is the case (among those explored in our simulations) most likely to result in convergence to fluctuating interior equilibria. Our illustrative figures present next the alternative parametrizations in these 9 cases (self-explaining from the titles and notes in each of the figures and from the corresponding discussion in section 2.3), all starting from an initial condition for $q_0^a = 0.50000001$.[28] We do not show below all analogous 18 cases when allowing for $\left|\tau^a - \tau^b\right| = 0.2$. and $\left|\tau^a - \tau^b\right| = 0.5$ instead.

We do not show either all analogous 27 alternative parametrizations to the simulations performed with initial condition for $q_0^a = 0.50000001$. In addition, we have simulated over 100 periods the same 27 cases under $q_0^a = 0.49999999$, $q_0^a = 0.25$ and $q_0^a = 0.75$, and these results are available upon request. As was noted in the introductory summary to this appendix, the respective four (for the four initial conditions for q_0^a) basic underlying R programs (whose parameters can be varied accordingly in replicating the essence of our findings) are available in a zip file archive upon request.

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[28] Note that, as we mentioned in the article, the simulation cases where the mean of the inflation shock is assumed zero eliminate, by construction in the codes, the drift term in the low-frequency AR(1) stochastic process for inflation as well as the feedback from the CBI (or institutional) channel. The reason is that in the programs we assume $\pi_0 = \mu_\varepsilon$ and $G_t^{*a} = G^{*a} = 0.5G^{*b} = 0.5G_t^{*b} = -\pi_0$. Exploring also $G_t^{*a} = G^{*a} = 0.5G^{*b} = 0.5G_t^{*b} = -\pi_0 = -\mu_\varepsilon = 0$ is done on purpose, as it allows direct comparison with the analogous simulation cases that differ only in that $G_t^{*a} = G^{*a} = 0.5G^{*b} = 0.5G_t^{*b} = -\pi_0 = -\mu_\varepsilon = 2$.

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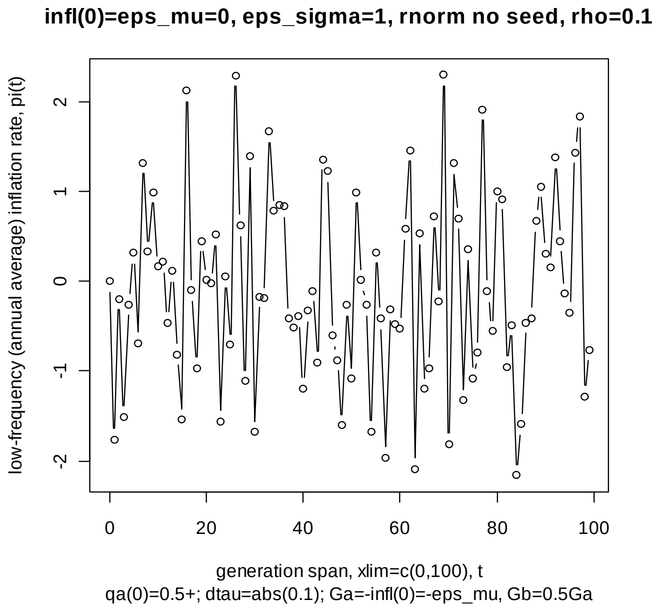

Figure 5: π_t dynamics under low vertical transmission differential, low inflation persistence, zero mean and unit variance of the inflation shock

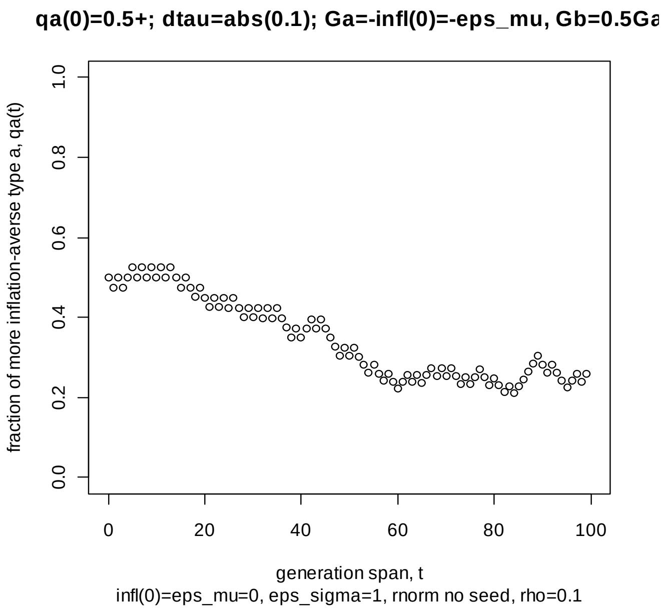

Figure 6: q_t^a dynamics under low vertical transmission differential, low inflation persistence, zero mean and unit variance of the inflation shock

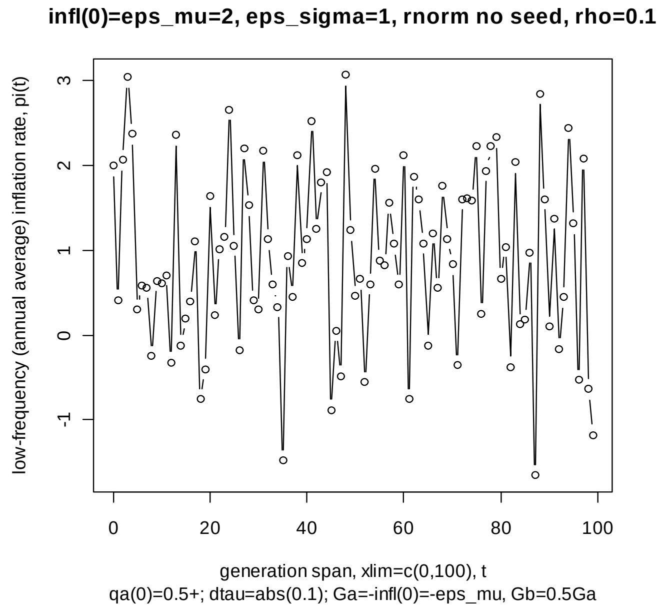

Figure 7: π_t dynamics under low vertical transmission differential, low inflation persistence, low mean and unit variance of the inflation shock

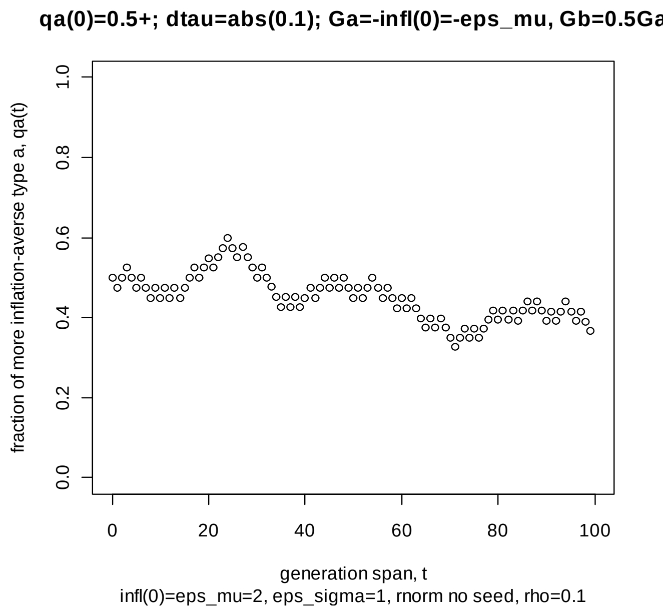

Figure 8: q_t^a dynamics under low vertical transmission differential, low inflation persistence, low mean and unit variance of the inflation shock

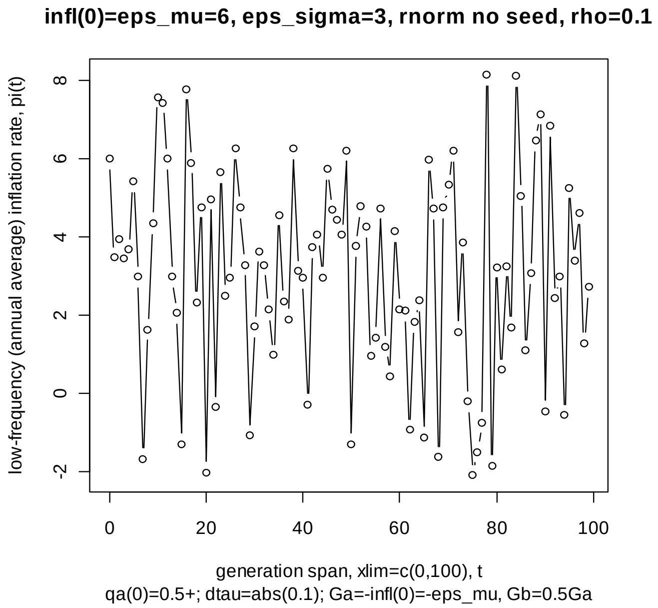

Figure 9: π_t dynamics under low vertical transmission differential, low inflation persistence, high mean and high variance of the inflation shock

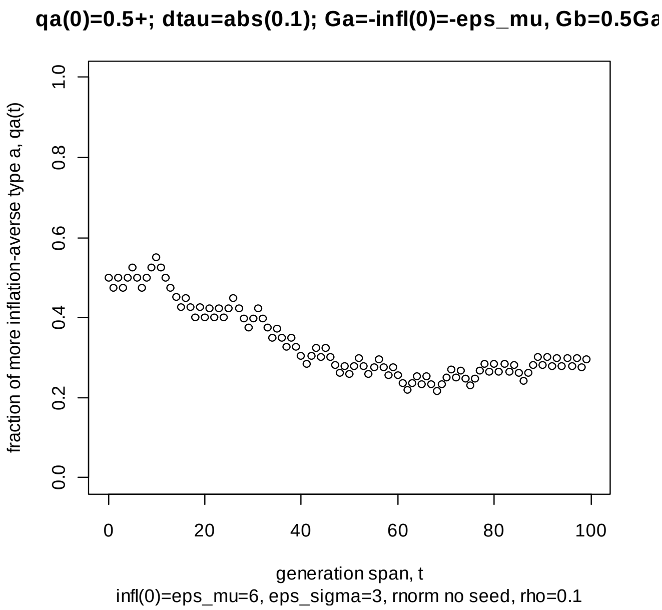

Figure 10: q_t^a dynamics under low vertical transmission differential, low inflation persistence, high mean and high variance of the inflation shock

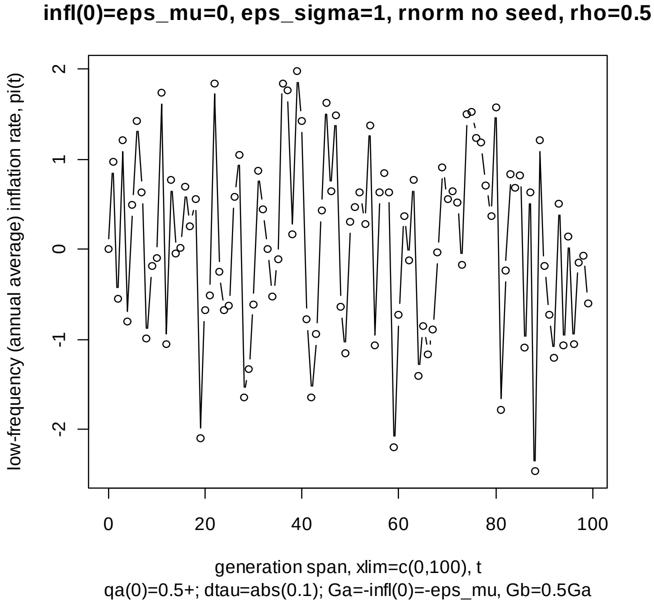

Figure 11: π_t dynamics under low vertical transmission differential, moderate inflation persistence, zero mean and unit variance of the inflation shock

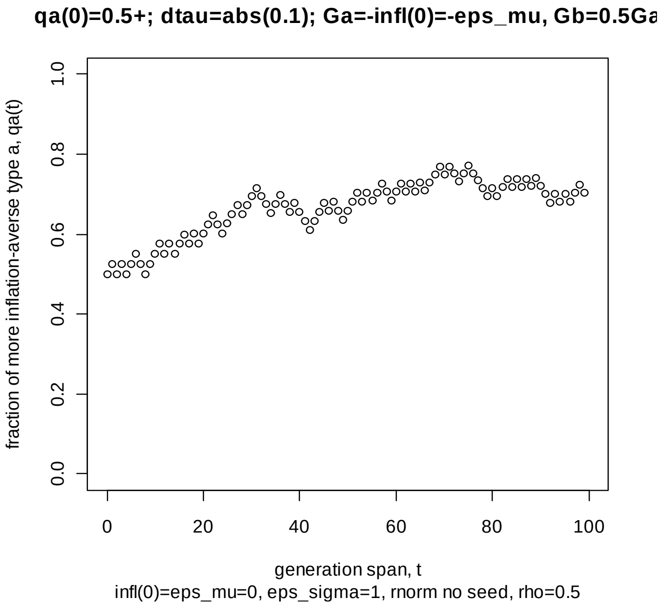

Figure 12: q_t^a dynamics under low vertical transmission differential, moderate inflation persistence, zero mean and unit variance of the inflation shock

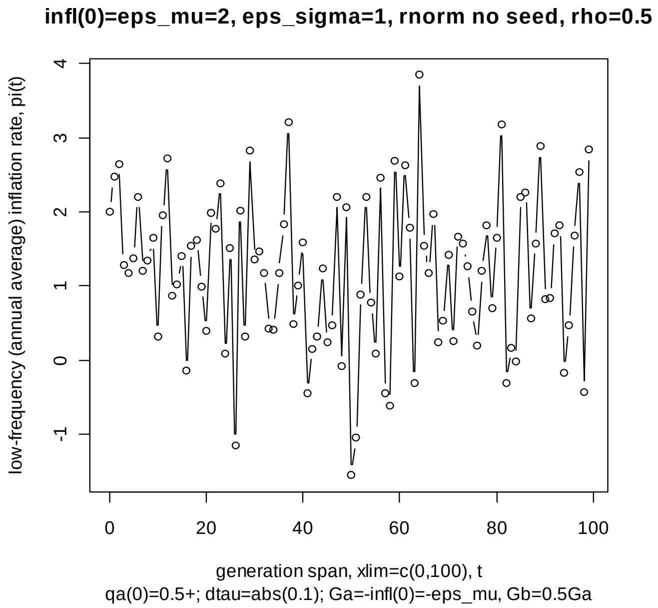

Figure 13: π_t dynamics under low vertical transmission differential, moderate inflation persistence, low mean and unit variance of the inflation shock

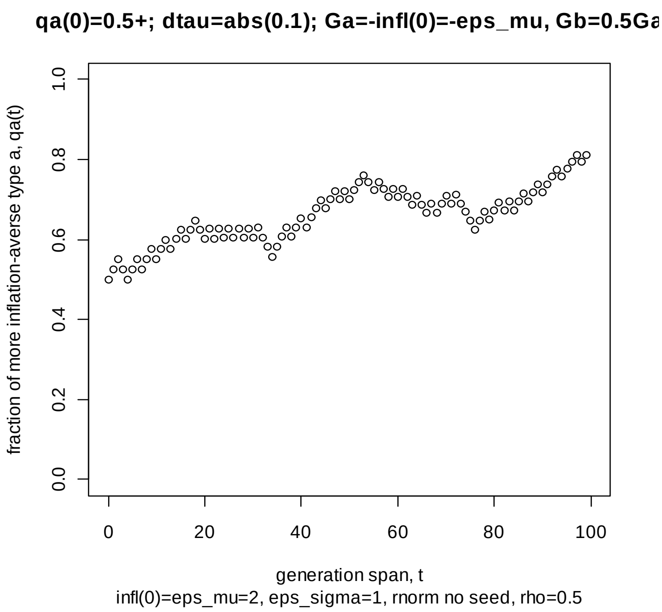

Figure 14: q_t^a dynamics under low vertical transmission differential, moderate inflation persistence, low mean and unit variance of the inflation shock

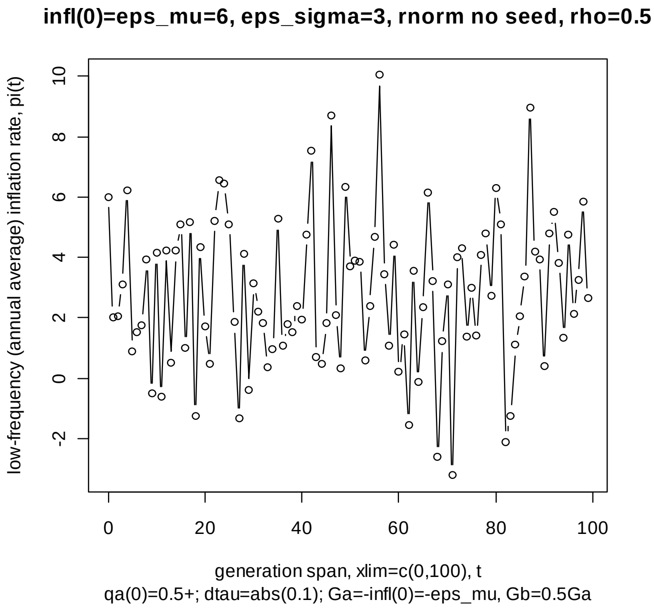

Figure 15: π_t dynamics under low vertical transmission differential, moderate inflation persistence, high mean and high variance of the inflation shock

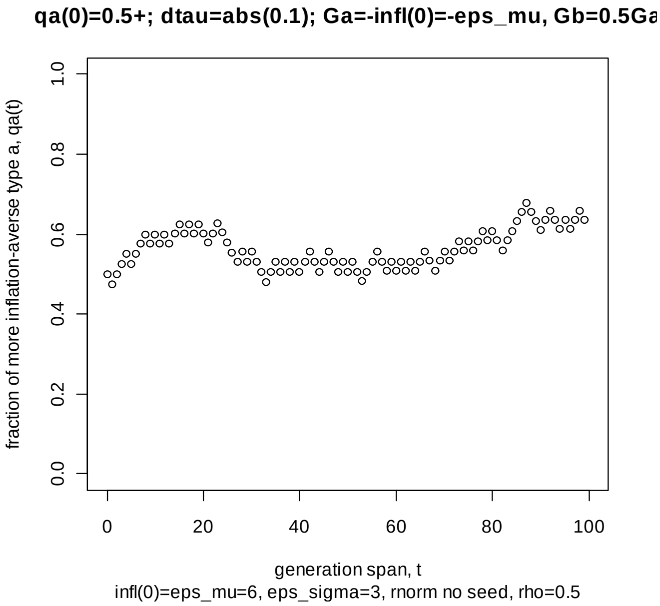

Figure 16: q_t^a dynamics under low vertical transmission differential, moderate inflation persistence, high mean and high variance of the inflation shock

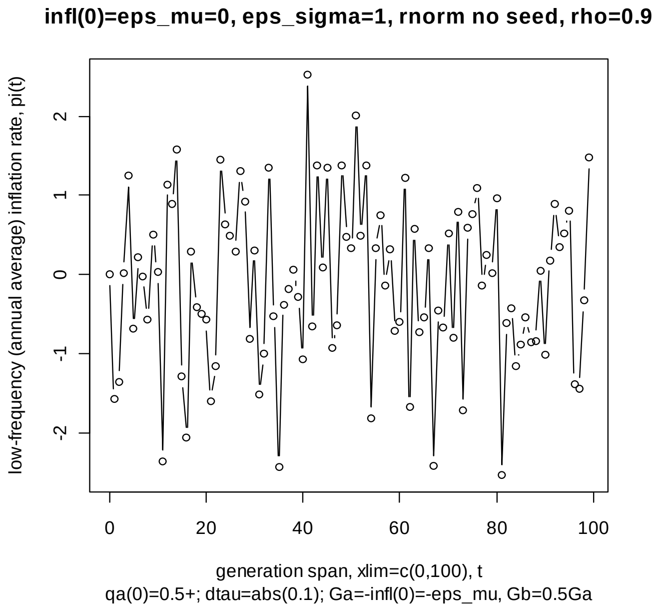

Figure 17: π_t dynamics under low vertical transmission differential, high inflation persistence, zero mean and unit variance of the inflation shock

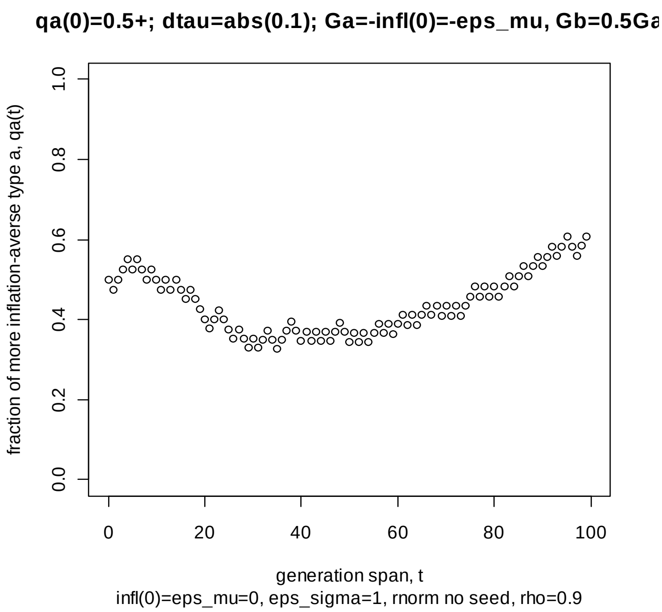

Figure 18: q_t^a dynamics under low vertical transmission differential, high inflation persistence, zero mean and unit variance of the inflation shock

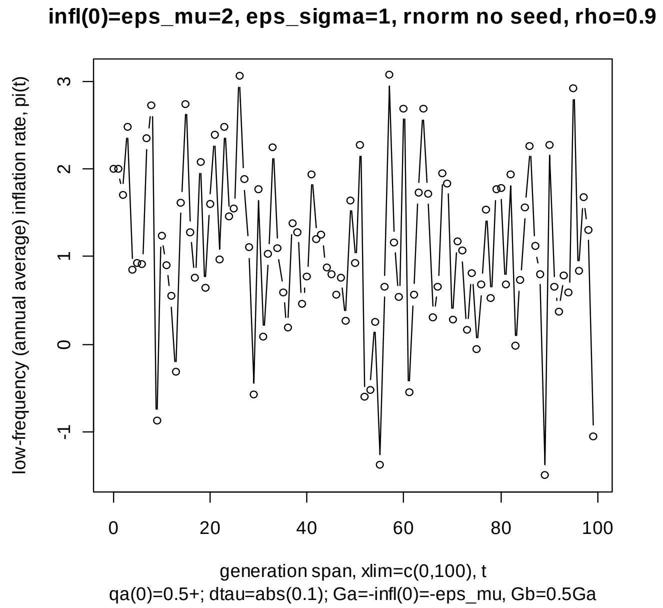

Figure 19: π_t dynamics under low vertical transmission differential, high inflation persistence, low mean and unit variance of the inflation shock

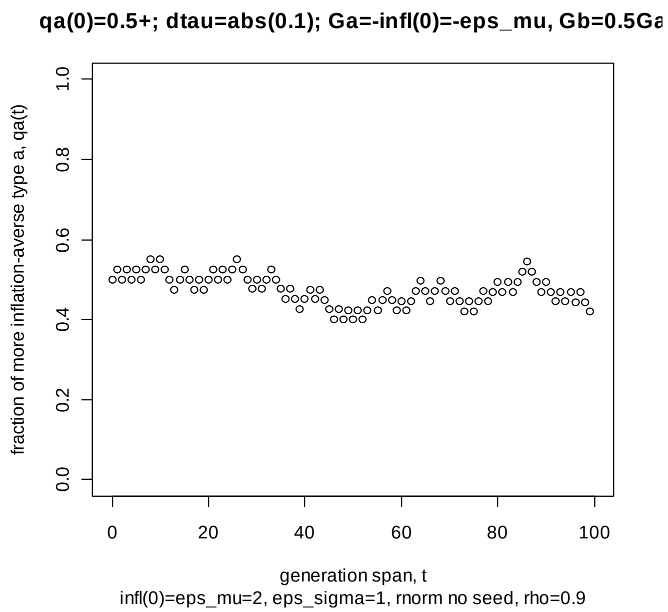

Figure 20: q_t^a dynamics under low vertical transmission differential, high inflation persistence, low mean and unit variance of the inflation shock

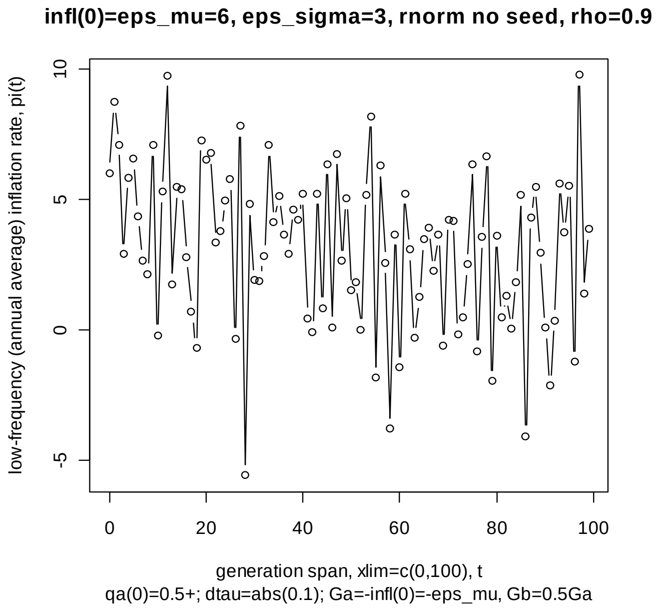

Figure 21: π_t dynamics under low vertical transmission differential, high inflation persistence, high mean and high variance of the inflation shock

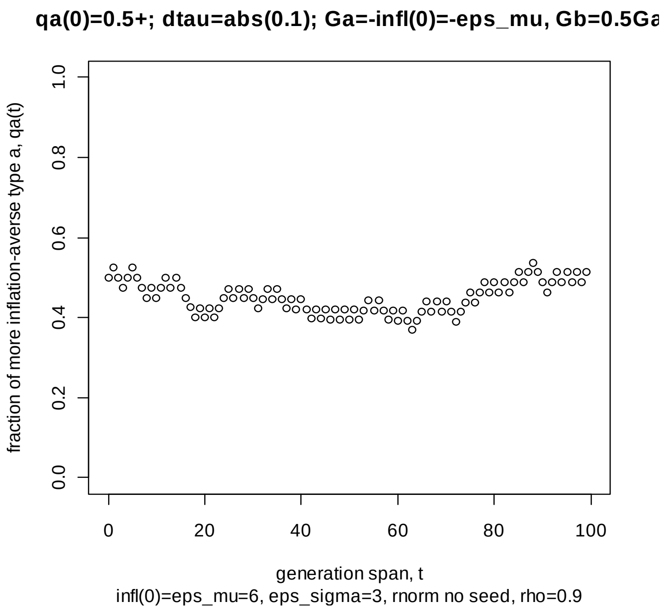

Figure 22: q_t^a dynamics under low vertical transmission differential, high inflation persistence, high mean and high variance of the inflation shock