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The Rate of Time Preference in the United States Government

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Abstract

I use Samuelson's Nonsubstitution Theorem (1961) to argue that government policies in the United States traditionally reflected a low discount rate. The government's discount rate appears to have risen sharply in the last generation, showing the usefulness of Samuelson's theorem and the difficulties facing the United States in the future.

Paper written on the occasion of the 90th birthday of Paul Samuelson

The Rate of Time Preference in the United States Government

I discuss in this paper the rising rate of time preference exhibited by the United States government in the late 20th and early 21st century. Paul Samuelson stressed the importance of the rate of interest over 40 years ago. I was a graduate student taking a reading course from him at the time, and I employed Samuelson's insight in my research at the time. I return to the centrality of the interest rate now to show both how Samuelson's work retains its relevance today and how current policies of the US government may pile up problems for America in the 21st century. I first review Samuelson's paper and the use I made of it at the time; then I argue for its application to the 21st century.

Samuelson (1961) derived a result that seems obvious today. In a world in which all capital is embodied labor, then only the interest rate matters for the determination of capital intensity. In the short run, a rise in wages will lead to a substitution of capital for labor, but the effect will be short lived. In the long run, the price of capital goods will rise proportionately to the wage rate. There will be no change in the ratio of capital to labor. Only if the interest rate changes will there be a change in capital intensity.

This proposition extends to a model in which capital is produced by other capital as long as the only primary input is labor. The indirect nature of production does not depend on a linear relationship between the amount of labor used at the last stage of its production and its price, but rather on the lapse of time between production at various stages. Because production takes place over time, there is an interest rate, and this rate is

the sole determinant of capital intensity. Samuelson called this a nonsubstitution theorem.

It would be hard to excite graduate students with this insight over forty years later. Samuelson had clarified the nature of the models we use to analyze production, and this understanding has passed into general knowledge. His paper however was intriguing in the early 1960s, and I used it to clarify a murky historical discussion.

Habakkuk (1962) asked in a contemporaneous book why the United States had defied its obvious comparative advantage in agriculture in the early nineteenth century to start industrialization. He answered that the high cost of labor caused Americans to use capital-intensive techniques in manufacturing, leading to high labor productivity. He drew on an extensive historical literature that noted how prosperous and how tall the early Americans were. His inference that these conditions provided the key to American industrialization stimulated a lot of discussion in the 1960s.

I applied Samuelson's insight to assert that high wages were not the cause of American industrialization. The historical issue was not as straightforward as Samuelson's demonstration due to the abundance of fertile American farmland. Wages were high and people were prosperous in the new republic because labor was used in combination with land. To emphasize this point, the dominant occupation at the time was farming. How then could the effects of land be disentangled from the question of capital in manufacturing?

I proposed a solution using a three factor model in which only one factor was mobile. Land was used only in agriculture, and capital was used only in manufacturing. Capital here referred to industrial buildings and machines. Agriculture was assumed to

yield its product within a year, and land fertility was a gift of nature rather than the result of prior investments. Labor was the mobile factor, and the relative price of agricultural and industrial goods determined how labor was allocated between the two activities. In agriculture, there were two primary factors, labor and land. In industry, by contrast, there was only one. Industrial capital had been produced some time in the past by labor; as embodied labor it did not constitute a separate primary factor. Samuelson's nonsubstitution theorem was directly applicable (Temin, 1966).

High American wages in this model were the result of abundant fertile land. Wages were high relative to the price of food, and people were tall and healthy as a result. The ratio of wages to the price of agricultural goods however had no effect on capital intensity in manufacturing in this model. Factor proportions in manufacturing were determined by the ratio of wages to the rental of capital. That ratio, by Samuelson's nonsubstitution theorem, was dependent only on the rate of interest. The level of American wages was irrelevant to the question of capital intensity in manufacturing.

The paper that resulted from this insight gave rise to controversy and continued inquiry into the origins of American industrialization that has continued in various guises for forty years. It also stimulated analysis of this limited kind of three good model as it applied to international trade (Jones, 1991). Since the interest rate—to the extent we know it after two centuries—was higher in the United States than Britain, other reasons have been sought to explain the capital intensity of American manufacturing. The tariff is one of the prime candidates (Harley, 1992; Irwin and Temin, 2001)

I argue here that Samuelson's nonsubstitution theorem is important today to understand the implications of current government policies. Agriculture has long since

ceased to the mainstay of the American economy, and I assume that the massive American capital stock is embodied labor from various times in the past. As I did earlier to analyze our early history, I abstract from the specific content of government policies to describe the discount rate that is common to them. In so doing, I shift attention from the interest rate as the result of productive processes to the discount rate of decision makers. I illustrate the commonality of the underlying discount rate by surveying policies in widely different aspects of the economy.

My argument is that the discount rate of the United States government increased dramatically in the late 20th and early 21st centuries. For a convenient starting point, I suggest that the rise in this discount rate came around the time of the first oil crisis in 1973. As Samuelson agued long ago, a higher interest rate will lead economic actors to avoid roundabout modes of production. The United States will suffer in the century to come if this higher discount rate becomes the operative interest rate for investments in America.

To demonstrate that this rise is not simply the result of policy changes in one specific area, I describe policies in several different areas with no apparent connection. This brief survey of course cannot be exhaustive, but it is suggestive of a wide-spread change in government attitudes. To reveal the time preference of the United States government before the first oil crisis, I describe the policies undertaken by Alexander Hamilton in the early years of the republic, the budget discipline observed throughout the nineteenth century, and the start of Social Security in the Great Depression. To demonstrate the change after the first oil crisis, I describe policies regarding the recruitment of teachers for our public schools, deregulation of utilities and related

industries, and budget policies in the 21st century as they have developed in the initial years of the new millennium.

Even without more detailed description, general knowledge suggests that the earlier group of policies were far sighted in that they prepared the country to progress over a long period. In other words, they revealed a low government discount rate. The later policies, by contrast, are designed for immediate gratification without much regard for the long-term implications. In other words, they reveal a high government discount rate. As Samuelson demonstrated in a simple model that still has implications for the country as a whole, this change in the discount rate will change the return on public investments and have a profound effect on future conditions in the United States.

When the United States began its history at the end of the eighteenth century, it was not clear how long it would last. There were many decisions to be made in the first years of the new republic and many public and private debates about them (Ellis, 2001). Prominent among the decision makers was the first Secretary of the Treasury, Alexander Hamilton. I focus here on his two classic reports to Congress as articulate expressions of the discount rate of the new government.

The most well-known of Hamilton's report was on public credit. In it, Hamilton argued that good public finances promoted good private finances which in turn promoted economic activity. This chain of reasoning has been shown to be true not only for the early nineteenth century, to which Hamilton was looking, but also to the later twentieth century. Growth regressions by a variety of authors have shown that good financial systems are associated with rapid economic growth (Levine, 1997; Rajan and Zingales, 1988).

Sylla (2003) applied this reasoning to the early United States. He noted that government bonds were traded widely in the early republic and that they were joined by state bonds almost immediately. Over time, private bonds were traded as well, providing a way for private individuals to accumulate resources for development. Within a few decades, banks too had become ubiquitous. The banks were chartered by state governments, and they typically were restricted to what we now call unit banks by politicians who were suspicious of all things monetary. Banks therefore typically accumulated capital from local people and loaned it to the bank's officers in a form of insider lending that appears to have functioned surprisingly well (Lamoreaux, 1994).

Given the suspicion of the new government, how was Hamilton to establish the reputation of public credit? He was writing in the aftermath of the Revolutionary War and then the Confederation in which states issued bonds with apparent abandon. The nascent financial markets were awash with depreciated state bonds of various types. Hamilton realized that investors would not be able to distinguish between many types of government bonds; he needed to take care of state bonds at the same time as he cared for federal bonds. His dramatic solution to this problem was to propose that the federal government assume the obligations of all outstanding state bonds (US Department of the Treasury, 1964).

This recommendation of course immediately increased the value of state bonds. They had been issued to troops during the war and other worthies thereafter, but they typically had been sold to speculators for immediate cash since repayment was hardly assured. Hamilton was accused at the time of being in the employ of financial speculators, and his reputation has suffered as well. As public policy, however, this

policy was about far more than immediate gain to a few shady people. As time has gone by, the identity of the speculators who received this windfall has been forgotten, while Hamilton's policy has been celebrated (Chernow, 2004).

Hamilton's policy accomplished two tasks. It created a uniform asset that could be traded and used as a standard for other credit operations, and it announced to the world that the new federal government was serious about establishing an orderly financial market. It was in other words a policy that incurred a short-run cost for a long-run gain, an investment in the infrastructure of economic growth. This investment would pay off over many years—as it seems in fact to have done—and the rewards would only have justified the immediate cost if Hamilton and the Congress were operating with a low discount rate.

To accomplish these tasks, the federal government needed to have stable source of revenue with which to service its new bonds. This revenue was a critical element of Hamilton's other well-known report on manufactures. Hamilton argued in this report that the United States needed to advance beyond its obvious comparative advantage in agricultural production. It needed to promote manufactures, the new activity just then taking hold in England, from which the United States had so recently separated itself. To promote American industry, Hamilton proposed a protective tariff. The tariff would aid manufactures, and it would raise revenue with which to service the government debt. It also gave rise to the literature cited above on the effect of the tariff on American manufacturing.

This report has been regarded as far less successful than the report on public credit because it was not adopted directly by Congress. Irwin (2004) however has shown

that almost all of Hamilton's proposals in the report on manufactures were adopted in a very short time, albeit not all at once. This report, like the other, was the basis of an enduring public policy, one that was complementary to the policy on public credit.

Manufacturing grew in the United States, as everyone knows, and we reap the benefits of this industrial expansion today. Hamilton anticipated these gains, and he valued this future growth highly because he discounted the future progress back to his time at a low discount rate. The indirect aid to commerce from the report on public credit and the direct aid to industry from the report on manufactures both were justified by use of an implicit low discount rate in the early years of the United States.

This low discount rate was shared by generations of policy makers throughout the nineteenth century. We can see the results of their action in the course of the public debt established by Hamilton. It is a truism of traditional public finance that debt increased during wartime and decreased during peacetime. Government debt was used to smooth consumption during periodic periods of stress, and taxation policies were accommodated to this end.

The results of this practice can be found in *Historical Statistics* (US Bureau of the Census, 1975, Series Y335-38). Barro (1987) reported similar UK data in the course of his explorations of interest rates in war and peace. The pattern in the nineteenth century is quite clear. The federal government borrowed during wartimes and repaid its loans after the wars. By not raising taxes enough to finance the wartime expenditures and by keeping taxes high enough to run surpluses thereafter, the government smoothed consumption over war and peace. This is a simple economic exercise, but it required a political consensus to carry out.

The essence of this consensus was that political leaders consistently took a long view of economic policy. During the wars they looked ahead to the subsequent peace, and during that longer period they restricted consumption to prepare for any future military needs that would require a burst of spending in a short time. As economic historians have shown, governments need to establish a reputation for repayment in order to borrow during emergencies (Dickson, 1967). Hamilton was able to jumpstart the reputation of the new government by assuming responsibility for old loans, but subsequent administrations needed to adhere to this policy in order to preserve this responsible regime.

In fact, the commitment to repay the debt was so strong that the federal debt was almost paid off twice. The first time was in the 1830s when the tariff and land sales were generating so much revenue that the debt was shrinking rapidly. It was politically difficult to change either one of these, and commentators wondered what would happen when the debt was paid off. Unhappily, we will never know because the boom of the 1830s collapsed, and the federal budget went into deficit (Temin, 1969). The government again threatened to pay off the entire debt in the 1880s, after the increase due to the Civil War. This possibility stimulated historical interest in the 1830s, but again the temporary end to a boom in economic activity resulted in more deficits during the 1890s.

These consistent policies by generations of political leaders reveal a consensus view that the role of the government was to use a long view in designing public policies. The government, in other words, operated with a low discount rate. It valued future consumption highly, and made provisions in the present to assure a high level of consumption in the future. Politicians were willing to make these investments for

prospective consumption because they implicitly used a low discount rate to value them. Present sacrifice was worthwhile with this low rate to augment future benefits.

The third example of a low discount rate comes from the twentieth century, during the collapse of the economic expansion that resulted in part from the policy stance of the United States government. In the midst of the Great Depression, Roosevelt introduced Social Security, an extension of the intergenerational bargain underlying debt policy, to provide income for older people. Workers were to pay Social Security taxes to finance the pensions of their parents' generation; the bargain was that their children would pay these taxes later to finance their retirement.

The first New Deal in 1933 included a variety of measures to revive the economy. Roosevelt's shotgun approach resulted in policies that often offset each other, but the net effect of these policies was to revive economic growth in the 1930s, even if not enough to reduce unemployment. The second New Deal of 1935-38 was an attempt to take a longer view. Roosevelt took the opportunity provided by the economic disarray in order to reform the government's social role. Various programs assured workers' safety and security, providing services we take for granted as governmental functions today.

Social Security has become the most popular of the measures in the second new deal. Originally planned to be partly funded, the administration decided that it could not impose Social Security taxes large enough to both provide benefits and to fund future benefits in the midst of a depression. The choice was to pay benefits immediately and create an unfunded retirement system. Young people paid Social Security taxes to provide pensions for their parents who had suffered in the depression and then later in the

war. Their pensions in turn were paid by the next cohort of workers (Diamond and Orszag, 2004).

We can view Social Security as another policy to smooth consumption. While debt policy smoothed consumption between war and peace in the nineteenth century, Social Security smoothed consumption over people's lifetime in the twentieth. In both case, the arrangements spanned generations and yielded benefits over a very long time. The design of these policies valued future consumption highly; that is, they resulted from a low discount rate.

In the second new deal as a whole, Roosevelt clearly took the long view. By legalizing unions and strengthening regulation of both communication and pharmaceuticals, he considered the effect of new policies on Americans many years into the future. He valued highly their conditions long after he was out of power because he used a low discount rate. He followed in the tradition of Hamilton that had been preserved roughly throughout the previous century and employed a low discount rate in formulating public policy.

These diverse examples rephrase conventional stories of American history. They bring together these apparently diverse strands in order to demonstrate the unity underlying them of a low discount rate in American public policy. This discount rate is implicit in most accounts of the period, but it is left in the background. The underlying assumption is that it is a characteristic of the American government that does not have to be insisted on because it has remained constant.

I however argue that the government's discount rate has not remained constant. Even as the United States has become rich indeed, the government has begun to use a far

higher discount rate than it used in the nineteenth century. This change did not come all at once, but it seems to have come around the time of the first oil crisis in the 1970s. Many events clustered around that time, and the oil crisis makes a convenient marker for the change, even if there is no apparent link between energy prices and the government's rate of discount. I therefore will survey three diverse policies since the oil crisis to contrast them with the earlier examples. As before, I choose widely disparate examples to show the unity of underlying discount rates.

The first policy is education. Like Social Security, education is the result of an intergenerational bargain. Parents provide for the education of their children, enabling them to earn good wages and support programs that benefit the elderly. One might say that Social Security and education fit together the way that Hamilton's two reports supported each other, for good education provides high earnings that provide a solid tax base to support future Social Security benefits. Investment in education therefore results from the same low discount rate seen in other policies.

The United States was the world leader in education through the middle of the twentieth century (Goldin, 2003). Public schools provided free elementary education throughout the nineteenth century. This was augmented by high school education between the two world wars and by a mixture of public and private universities after the war. This path of universal education has been followed around the world, although the United States was there first and has carried it the farthest.

This achievement now is being threatened. The foundation of our educational system—the public schools—are in disarray. The press is replete with stories of schools in one kind of trouble or another, and our children now do worse than the children of

other countries in standardized tests. Public policy has gone in the direction of imposing more tests on school children in an effort to make schools accountable and students better prepared.

The prospects for these reforms are not bright because we have let the quality of our teachers deteriorate over the past half century and particularly since the 1970s. The spread of education in the nineteenth century was accompanied by the feminization of the teaching staff. By the beginning of the twentieth century, the vast majority of teachers were women. Teaching was a good job for these women because their opportunities for gainful employment were limited. There were a variety of relatively unskilled jobs in traditional industries like textiles and shoes that were open to women, but there were few alternatives for women who wanted something more intellectually challenging. The job market for women has changed dramatically in the last generation as we have liberated women. Unhappily at the moment, we have not been willing to pay enough to attract high-quality teachers in an open market (Murnane, 1991; Flyer and Rosen, 1997; Lakdawalla, 2001; Goldin and Katz, 2002).

I have argued that the market for teachers today is characterized by multiple equilibria because the demand for teachers depends on their quality as well as their wage. This did not cause any problems, that is, multiple equilibria, in the past because there was a limited market for the services of women. Women went into teaching as much for the challenge it posed as for the wage, and quality was not highly dependent on the wage offered. Women's liberation has allowed women to choose jobs, and they have moved into a variety of interesting positions in the last generation. The quality of teachers

became responsive to the salary offered as a result, and multiple equilibria appeared (Temin, 2002).

The implication of this analysis is that it will be very hard to improve the quality of American schools. We would need to break out of this stable equilibrium, attract a new breed of teachers, and settle into a new higher paying equilibrium. None of the current reforms even comes close to making that attempt. The No Child Left Behind Act even makes the problem of teacher recruitment worse by encouraging teaching to the tests mandated in the act. Current educational reforms are doomed to failure as a result, and the available empirical evidence suggests that they are in fact failing. It is a sign of a high discount rate not to make the needed investments in the future workforce of the United States.

The second modern policy is deregulation as practiced in the United States during the last generation. The regulatory regime for utilities and related companies survived from the Progressive period and the Great Depression until the 1970s and 1980s when a broad movement for deregulation arose. There are many reasons for the change in policy and myriad aspects of deregulation, but I will comment on only one dimension: the implicit discount rate. In many cases, the motivation for deregulation was to improve efficiency by removing redundancies. Drawing down excess capacity, possibly induced by regulation itself, would increase efficiency and decrease costs (Vietor, 1994).

Some of these apparent redundancies, however, were buffers that made the system work reliably. Fluctuations in markets require adjustments that are made easier by the presence of a buffer. Absent a good buffer, surges in demand or restrictions in supply can wreak havoc in deregulated markets. Drawing down capacity in several

industries is sign of a high discount rate, since it does not prepare for crises in the future. Since the timing of surges appears stochastic, some of these industries have experienced trouble in the short run. The immediacy of the problems should not blind us to an underlying cause, the rise in the government's discount rate.

Airlines were deregulated in the 1980s under the slogan that flyers previously had been paying for their seat and the one next to it (where they put their briefcases). The results included lower fares and more frequent flights to some locales, but the deregulated industry has not settled down to a new equilibrium. As I write in early 2005, most airlines are in trouble, many of them in bankruptcy. Their response has been to abandon the pension systems they set up for their workers. This has been reported as a challenge to the government's pension insurance scheme, but it needs also to be seen as the abandonment of a long-run commitment.

Electric power was deregulated at about the same time. Large industrial users in New England and California objected the high prices they were paying for electric power, and they lobbied for deregulation. Integrated power companies were replaced by separate generator companies and distribution firms. In the middle is the grid, managed by public and semi-public system operators. The presence of intermediate markets allowed prices to be more equal around the country, and it also reduced the redundancy in the system (Joskow, 1997). The result was to make the system vulnerable to extreme conditions. California experienced such conditions in 2000-01, and the system broke down in the sense that shortages created market power, resulting in higher prices and lower supplies than before deregulation (Joskow, 2001). There has been lots of discussion about bad deregulatory design, but that is only one issue. The more relevant

issue here is the reduction in redundancy as a sign of a high discount rate. We apparently were not willing to pay enough now to prepare for stochastic events in the future. The long-run aspect of this choice has been obscured by the immediacy of the California crisis; it was a bad break to need more redundancy so soon.

Finally, in this survey of deregulation comes the reduction in hospital beds mandated by a change in government reimbursement rates in the 1990s. The government went from a system of indemnity payments to payments according to Diagnoses Related Groups. The new system reduced hospital usage and, as a result, the number of hospitals. Observers considered it a success as occupancy rates rose in the remaining hospitals. Only belatedly did they realize that emergency departments only can operate if there are empty hospital beds. The emergency stabilizes patients and admits them to the hospital for longer-run care; it cannot operate if there are no beds free (Schafermeyer and Asplin, 2003).

As in the other cases, redundancy was eliminated without a thought for the role that redundancy serves. Policy makers thought of the immediate gains from reducing redundancy; they did not take the longer view to see how the medical system fits together and the role that redundancy plays in this system. They implicitly utilized a very high discount rate. The result has been a boom and bust cycle in hospital construction. After closing many hospitals in the last decade, we are now expanding the remaining institutions.

The final policy considered here is the same as the second one described for the 19th century: budget discipline. This example does not apply to the federal government at all times in the past quarter century; it instead applies to some Republican administrations

after the oil crisis: Ronald Reagan and George W. Bush both acted as if budget discipline was passé. As the vice president was quoted during the 2004 presidential campaign, "Deficits don't matter."

It can be objected that both administrations were wartime governments. Reagan led the Cold War, and the younger George Bush led the invasion of Iraq. Unlike other wars, however, both presidents reduced taxes during wartime. The previous tradition had been to smooth consumption by a mix of taxes and borrowing; the modern Republican strategy is to cut taxes and encourage a burst of both private and public (military) consumption. It is what Dornbusch and Edwards (1991) called Populist economics in Latin America. It is a reflection of a high discount rate.

Louis the XIV had a famously high discount rate: "Après moi, le déluge." Our government's discount rate may not be that high today, but it does appear to be markedly higher in government policies after the first oil crisis than in the first almost two centuries of the American republic. One result of the rising discount rate is that life in the United States will be harder for the next generation than for the current one. Without a lower discount rate, government policies will not invest in services for the future as much as they did previously.

Samuelson's nonsubstitution theory therefore provides a lens through which to provide a unified view of varied public policies. We can see a profound change in the discount rate used by the government during the last generation. There is no reason to suggest disaster as a result, following Louis XIV, but there is cause to expect that American economic life may be harder in the years to come. In this way, Samuelsonian economics informs us about economic conditions in the 21st century.

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