

DO COUNTRIES DEFAULT IN “BAD TIMES”?

Michael Tomz

Department of Political Science,
Stanford University

Mark L. J. Wright

Department of Economics, University of
California, Los Angeles and Federal
Reserve Bank of Minneapolis

Abstract

This paper uses a new dataset to study the relationship between economic output and sovereign default for the period 1820–2004. We find a negative but surprisingly weak relationship between economic output in the borrowing country and default on loans from private foreign creditors. Throughout history, countries have indeed defaulted during bad times (when output was relatively low), but they have also suspended payments when the domestic economy was favorable, and they have maintained debt service in the face of adverse shocks. This constitutes a puzzle for standard theories of international debt, which predict a much tighter negative relationship as default provides partial insurance against declines in output. (JEL: F21, F34, F41)

1. Introduction

What is the relationship between economic output and sovereign default? Do countries violate their foreign debt contracts only in “bad times,” when domestic output is low, or do some default even when their domestic economy is performing well? The answers to these questions are important for understanding the degree to which default conveys insurance against economic adversity, and the frequency with which governments use default as an opportunistic strategy to seize the most resources for themselves. The answers could also inform supranational and creditor-country approaches to debt crises.

This paper uses a new data set to study the relationship between economic output and sovereign default for the period 1820–2004. We find that countries

Acknowledgments: We thank Gita Gopinath for sharing her MATLAB code, Michael Adler for providing access to his *Sovereign Bond Database*, and Cristina Arellano, Aart Kraay, Guido Sandleris, and Jeromin Zettlemeyer for offering helpful comments. Tomz thanks the National Science Foundation (CAREER grant SES-0548285), the Stanford Center for International Development, and the Center for Advanced Study in the Behavioral Sciences for financial support. Part of this paper was written while Tomz was a Visiting Scholar at the Federal Reserve Bank of Minneapolis. The views expressed herein are those of the authors and not necessarily those of the Federal Reserve Bank of Minneapolis or the Federal Reserve System.

E-mail addresses: Tomz: tomz@stanford.edu; Wright: mlwright@econ.ucla.edu

default on loans from private foreign creditors more often in “bad times” than in “good times.” The relationship is surprisingly weak, however: domestic output often declines without triggering a default, and countries occasionally suspend payments or reschedule their obligations when domestic output is high. We contrast these empirical findings with the predictions of several widely used models in which default provides partial (and costly) insurance against declines in output. We show, through simulation, that the models predict a much stronger output-default relationship than occurs in the historical record. We conclude by suggesting how future research might bridge the gap between theory and evidence.

2. Output and Default in History

Our empirical analysis focuses on loans to sovereign governments from private foreign creditors. For each year from 1820 to the present, we identified all sovereigns that owed money (excluding trade credits) to foreign bondholders and commercial banks, and therefore had the potential to default. For the period before 1914, our measure of debtor status is based on a comprehensive search of archival and secondary sources for six major capital markets—Amsterdam, Berlin, Frankfurt, London, New York, and Paris—as discussed in Tomz (in press). We constructed comparable measures of foreign indebtedness for the period 1914–1969 from Michael Adler’s *Sovereign Bond Database* and *Moody’s Manual of Government Debts*, and for 1970–present from the World Bank’s *Global Development Finance*.

We classified a borrower as having defaulted if it failed to pay interest and/or principal on schedule, or if it exchanged bonds or rescheduled bank loans on “less favorable terms than the original loan” (Beers and Chambers 2004). Defaults ended when a majority of creditors agreed to a settlement package.¹ Data on defaults came from Duggan and Tomz (2006) for the nineteenth and early twentieth centuries, Suter (1990) for the middle decades of the twentieth century, and Beers and Chambers (2004) for the modern period.

By our definition, 106 countries have defaulted a total of 250 times since the end of the Napoleonic Wars. The most common defaulters—Costa Rica, Ecuador, Mexico, Uruguay, and Venezuela—each experienced at least eight distinct spells of default. Ecuador and Honduras hold the record for the longest periods in default; beginning with their initial loans as members of the Central American Confederation in the 1820s, each has accumulated nearly 120 years of non-compliance. In our sample, new defaults arose in every decade and were most common during the

1. A country is defined to be in default in a given year if it was in default for any month of that year, with the exception of defaults that are settled in January of a given year, which are assumed to imply that the country is not in default for that year.

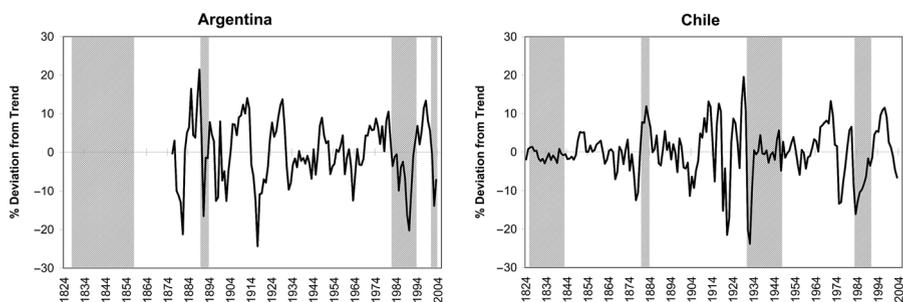


FIGURE 1. Defaults and economic activity in Argentina and Chile.

1980s, when more than 50 countries (about 40% of all nations that owed money to private foreign creditors) failed to pay in full on schedule.

Finally, we measured good and bad economic times by collecting annual estimates of real gross domestic product in local currency. The World Bank's *World Development Indicators* provides data for most of the post-war period, which we extrapolated backward with country-specific sources and compendia such as Maddison (2001). We then measured business cycles as the deviation from trend, as estimated with the Hodrick-Prescott filter. With annual data like ours, researchers disagree about the most appropriate value for the Hodrick-Prescott smoothing parameter. We present results for a value of 400 (Cooley and Ohanian 1991), but our findings are robust to other proposed values such as 6.25 (Ravn and Uhlig 2002) and 100 (Backus and Kehoe 1992).²

Figure 1 gives an initial impression of the relationship between output and default. The figure displays business cycles (solid lines) and default periods (shaded regions) for Argentina and Chile, two prominent debtors for which we have long series of output data. In Argentina, the defaults of 1890, 1982, and 2001 coincided with steep declines in output relative to the Hodrick-Prescott trend. The same is true of Chile, which defaulted during the Great Depression and during a sharp contraction in the early 1980s. A closer look, however, reveals that the Chilean defaults of 1826 and 1880 occurred in relatively good times. Moreover, the figure shows numerous occasions in which output fell sharply, but the Argentine and Chilean governments nonetheless upheld their obligations to foreign creditors.³ At least in Argentina and Chile, bad times were neither necessary nor sufficient triggers for sovereign default.

2. These results are contained in an appendix available from the authors.

3. This pattern is not due to a pause in borrowing. Both Argentina and Chile have been international debtors without interruption since the early 1820s, and their debt levels increased steadily during the years 1865–1914 (the “golden age of international finance”), yet many economic downturns in this period did not lead to default.

TABLE 1. The relationship between output and default.

	Historical data	Simulation	
		Transitory shocks	Permanent shocks
Mean deviation from trend (%)			
In first year of default	-1.6	-41.6	-7.4
In periods of default	-1.4	-25.7	-5.6
In last year of default	-1.3	-13.6	-4.5
In periods of non-default	0.2	0.0	0.4
Country years below trend (%)			
In first year of default	61.5	100.0	85.9
In periods of default	56.2	83.8	78.1
In last year of default	58.8	75.5	72.9
In periods of non-default	47.2	50.0	48.3

Note: The historical data set includes 9,251 observations (borrower-years), of which 1,594 are in default. The data cover 169 defaults (first year of default) and 160 settlements (last year of default).

We next examine whether these patterns hold in a larger sample of countries. Our new data set contains measures of GDP and default for 175 debtor countries. In Table 1 the column labeled “historical data” shows that, on average, output was about 1.6 percentage points below trend when countries decided to suspend or reschedule payments, and the economies of defaulting countries underperformed by about 1.4 percentage points during the entire period of noncompliance. In contrast, output exceeded the Hodrick-Prescott benchmark by about 0.2% during non-default years. Table 1 further shows that about 62% of the 169 default episodes in our sample began in bad times. Taken together, these estimates confirm that defaults are more common in bad times than in good.

Nonetheless, the relationship between output and default is weak. In more than 39% of all observations, countries managed to avoid default even though output was below trend.⁴ Furthermore, in nearly 44% of all years in which countries were not meeting their obligations, the default continued even though output had surged above trend. Our estimates further imply that more than one-third of defaults began during good times, and that more than half of defaults ended during bad times (see the row labeled “last year of default,” which indicates the year in which debtors settled their arrears with creditors).

Would the relationship prove stronger if we examined the effects of severe drops in output? To explore this possibility, we sorted the data according to the depth of the economic downturn. Defaults were about twice as likely during the most severe economic contractions (more than 7% below trend) than during other periods. This finding implies a negative but nonlinear relationship between output

4. Countries honored their obligations in 7,654 of the 9,251 observations in the sample. Table 1 shows that output was below trend in 47.2% of those 7,654 non-default periods. We compute $47.2 \times 7,654 / 9,251 = 39.1$.

and default. Even so, only one-third of debtors lapsed into default when falling on extremely hard times, and roughly one-fifth defaulted while experiencing a boom in which output exceeded trend by more than 10 percentage points.

In summary, defaults are significantly but not overwhelmingly associated with bad times. In an (unpublished) appendix, we show that this conclusion holds even when one varies the sample of countries by income or population, or restricts the time period under study. Of special note, results for the postwar period closely resemble results for the entire sample, reflecting the fact that three-quarters of our data come from post-1945.

3. Output and Default in Theory

How well do existing models reflect the empirical reality? We analyze the model of sovereign default in Aguiar and Gopinath (2006), which represents a major class of models introduced by Eaton and Gersovitz (1981) and shares elements with recent papers by Arellano (2005) and Yue (2006). Consider a country represented by an agent with preferences over state contingent consumption sequences given by

$$E_0 \sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-\sigma} - 1}{1-\sigma},$$

for some $\sigma > 0$. Each period, the country receives an exogenous endowment of the single non-storable consumption good y_t , which evolves stochastically according to $\ln y_t = \ln \Gamma_t + z_t$. Here, Γ_t represents a stochastic trend in output which evolves according to $\ln \Gamma_{t+1} = \ln \Gamma_t + \ln g_{t+1}$, and the growth rate in this trend follows

$$\ln g_{t+1} = (1 - \rho_g) \left(\ln \mu_g - \frac{1}{2} \frac{\sigma_g^2}{1 - \rho_g^2} \right) + \rho_g \ln g_t + \varepsilon_{gt+1}$$

$$\text{where } \varepsilon_{gt+1} \sim N(0, \sigma_g^2).$$

The term z_t captures transitory movements in output and evolves according to

$$z_{t+1} = \mu_z(1 - \rho_z) + \rho_z z_t + \varepsilon_{zt+1}, \text{ where } \varepsilon_{zt+1} \sim N(0, \sigma_z^2).$$

Each period t begins with the country owning a (possibly negative) stock of foreign bonds a_t which represent a claim to one unit of the consumption good. If the country defaults, it is excluded from international capital markets (see Wright 2002 and Tomz, in press) and therefore loses its ability to smooth its consumption. The model includes, in addition to the cost of exclusion, a “direct” output cost of

default equal to a fraction δ of the borrower’s endowment. Exclusion from financial markets ends with probability λ each period, at which point output returns to normal and the country can reaccess international capital markets starting with zero debts. A country with access to capital markets can smooth its consumption by trading in foreign bonds at price q_t .

The model is closed by specifying that international capital markets are populated by a large number of risk neutral investors facing an opportunity cost of their funds r^* . Given a probability of default as a function of assets $\pi(a_t)$ (to be determined endogenously), investors will lend to a country at the nonlinear price $q(a_t) = (1 - \pi(a_t))/(1 + r^*)$.

Aguiar and Gopinath (2006) consider two versions of this framework. In the “transitory shock” version, movements in output are transitory about a deterministic trend ($\ln \Gamma_t$ is deterministic). In the “permanent shock” version, only stochastic movements in the growth rate of the economy drive fluctuations in output ($z_t = 0$ for all t). We solve both versions of the model numerically using the algorithm in Arellano (2005).⁵ We simulate the model for 4,000 years, extract the last 2,000 years to eliminate the effects of initial conditions, and then average over 100 repetitions of this process.⁶

Both versions of the model predict a much tighter negative relationship between default and output than is found in history. As Table 1 shows, default begins with output below trend in 85% of the permanent-shock simulations and 100% of the transitory-shock simulations, versus only 62% in actual data. Additionally, both versions predict economic underperformance in approximately 80% of default years; the analogous historical statistic is only 56%.

The model dramatically overpredicts the magnitude of output declines during defaults, as well. In history, defaults began when output was an average of 1.6% below trend. But in the simulations with transitory shocks, the typical default was triggered by a startling 41% shortfall in output. Even in simulations with permanent shocks, defaults started with contractions that typically exceeded 7%. For the duration of a default, output stayed an average of 25% below trend in the stationary model and 6% below trend with permanent shocks, compared to only 1.4% in the data.

Could different parameter values improve the fit? On some dimensions, the answer is no. By assuming that default provides insurance against adverse economic shocks, the model “hardwires” a strong negative correlation between output and default in the first year of a default for all parameter values. Along other dimensions, an improved fit may be possible. Longer defaults, for example, would allow

5. As described in an appendix available from the authors, we annualize the quarterly parameter values presented in Tables 3A and 3B of Aguiar and Gopinath (2006), yielding $\sigma = 2$, $\delta = 0.02$, $\beta = 0.41$, $r^* = 0.041$, $\lambda = 0.34$, $\mu_g = 1.02$, $\rho_g = 0.0008$, $\sigma_g = 0.07$, $\rho_z = 0.66$, and $\sigma_z = 0.19$.

6. Simulations in which no default occurred are discarded in computing moments conditional on default.

more time for output to rise above trend during a default, and a lower direct output cost (smaller δ) would reduce the discrepancy between simulations and data in mean output levels conditional on default. Both Aguiar and Gopinath (2006) and Yue (2006) assume a direct output cost of default of 2%, based on estimates by Chuhan and Sturzenegger (2005). We find, however, that output is only 1.4% below trend during periods of default, versus 0.2% above trend when the borrower is in good standing. Thus, in order to match the data, the direct output cost of default in the model cannot be larger than (and may need to be much less than) 1.6%.

To examine this possibility, we reduced the direct output cost to zero and calibrated the annual probability of settlement such that defaults would last an average of 10.1 years, the value in our historical data set. With these changes, only two-thirds of simulated default years show output below trend, which is roughly in line with the data. Unfortunately, these changes drastically reduce both the frequency of debt defaults and the amount of debt a country can accumulate. Moreover, the severity of the output contraction during defaults remains an order of magnitude larger than in the data. It appears, therefore, that even substantial changes in parameter values will not cause the model to match the main moments in the data.

4. Conclusions

In this paper, we have provided the first long-run analysis of the relationship between default and economic performance. Our study, based on a new data set, shows a negative but unexpectedly weak relationship between output and default. Throughout history, countries have indeed defaulted during bad times, but they have also suspended payments when domestic economic conditions were highly favorable, and they have maintained debt service in the face of severe adverse shocks. This pattern is puzzling, not only because it seems inconsistent with the conventional wisdom that countries default only when output is low, but also because it stands at odds with prominent models in which default provides costly insurance against economic adversity.⁷

These findings demonstrate the need to revise our models of sovereign debt. We conclude by offering three conjectures for future work. First, defaults may provide insurance, not against variation in aggregate output as assumed by current

7. It is possible that a different definition of “bad times” would produce results more in line with the conventional wisdom. The Hodrick-Prescott filter we employ is by far the most widely used technique for constructing business cycles, but a stronger negative relationship might be found with other methods, such as a band-pass or a Bry-Boschan filter. Preliminary analysis suggests that our findings are robust to these other filtering methods. Regardless of whether alternative methods can restore a strong negative relationship between default and output in the data, though, our findings show that existing models fail to match key features of the data.

models, but instead against fluctuations in some narrower component of economic activity. For example, default may be the optimal response to severe declines in exports, government revenues, or the output of the tradeables sector. Likewise, default may help countries cope with increases in the cost of capital, and would therefore be more likely to occur when world interest rates rise.

A second direction for research would explore the interaction between domestic and international forces. Perhaps defaults offer the most relief when economic downturns cannot be smoothed by additional borrowing. By this logic, one would expect a contingent relationship between output and default: Countries respond to domestic recessions by borrowing when global capital markets are flush, and by defaulting when adverse conditions in international markets make additional borrowing difficult. New models, built on these premises, could help explain the otherwise puzzling fact that declines in output trigger default in some historical episodes but not in others. Models of this class could also explain why, over the past two centuries, defaults have occurred in waves, with the largest surges in the 1820s, 1870s, 1890s, 1930s, and 1980s (see, e.g., Suter 1990 and Tomz, *in press*). These waves, we conjecture, occurred when recessions in borrowing countries coincided with contractions in key creditor nations.

Finally, more energy should be devoted to developing mixed-motive models of default. Many defaults over the past two centuries have coincided with dramatic collapses in economic activity, and therefore seem consistent with default as a form of insurance. A notable proportion of defaults occurred during good times, however, when economic circumstances at home clearly would not warrant a lapse of payments. As Tomz (*in press*) notes, many of these seemingly inexcusable defaults occurred when political upheavals brought new coalitions to power that favored default for opportunistic or ideological reasons. A model of default that includes not only economic but also political shocks—that incorporates not only good and bad times, but also good and bad governments—could account for significantly more of the historical record than models that are currently available.

These conjectures, if valid, could have important policy implications. There has been much debate in recent years about policies to reduce the frequency and costs of sovereign default. Research on the economic and political sources of default could help leaders prevent defaults, or at least forecast them more accurately and address their root causes. Research could also specify the likely consequences of making defaults less costly. To the extent that defaults arise for opportunistic reasons, and not simply as a way to smooth consumption, policymakers should exercise caution in reducing the costs of default. After all, such efforts could have the perverse effect of encouraging opportunistic lapses of payment. The results in this paper not only advance our understanding of key theoretical issues in the literature but also lay a foundation for empirically informed improvements to the international financial architecture.

References

- Aguiar, Mark, and Gita Gopinath (2006). "Defaultable Debt, Interest Rates, and the Current Account." *Journal of International Economics*, 69, 64–83.
- Arellano, Cristina (2005). "Default Risk and Income Fluctuations in Emerging Economies." Working paper, University of Minnesota.
- Backus, David K., and Patrick J. Kehoe (1992). "International Evidence on the Historical Properties of Business Cycles." *American Economic Review*, 82, 864–888.
- Beers, David T., and John Chambers (2004). "Sovereign Defaults: Set to Fall Again in 2005." *Standard & Poor's Ratings Direct*, September 28.
- Chuhan, Punam, and Federico Sturzenegger (2005). "Defaults Episodes in the 1980s and 1990s: What Have We Learned?" In *Managing Economic Volatility and Crises*, edited by Joshua Aizenman and Brian Pinto. Cambridge University Press.
- Cooley, Thomas J., and Lee E. Ohanian (1991). "The Cyclical Behaviour of Prices." *Journal of Monetary Economics*, 28, 25–60.
- Duggan, Catherine, and Michael Tomz (2006). "Sovereign Debt, Defaults and Settlements, 1820–1914." Working paper, Stanford University.
- Eaton, Jonathan, and Mark Gersovitz (1981). "Debt with Potential Repudiation: Theoretical and Empirical Analysis." *Review of Economic Studies*, 48, 289–309.
- Maddison, Angus (2001). *The World Economy: A Millennial Perspective*. OECD.
- Ravn, Morten O., and Harald Uhlig (2002). "On Adjusting the HP-Filter for the Frequency of Observations." *Review of Economics and Statistics*, 84, 371–376.
- Suter, Christian (1990). *Schuldenzyklen in der Dritten Welt*. Anton Hain.
- Tomz, Michael (in press). *Sovereign Debt and International Cooperation*. Princeton University Press.
- Wright, Mark L. J. (2002). "Reputations and Sovereign Debt." Working paper, MIT.
- Yue, Vivien (2006). "Sovereign Default and Debt Renegotiation." Working paper, New York University.