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Daniel A. Dias; Christine Richmond; Grant Westfahl

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Duration of Capital Market Exclusion: An Empirical Investigation*

Daniel A. Dias† Christine Richmond‡ Grant Westfahl§

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Abstract

This paper investigates the duration of market exclusion following a sovereign default and its resolution. We employ multiple definitions of market access, differentiating between gross versus net borrowing and partial versus full access, to measure the time it takes for countries to regain entry into international capital markets following a sovereign default and resolution. Our findings indicate that market re-access can occur immediately under less stringent definitions but may take several years when more demanding criteria are applied. Middle-income countries typically regain access more quickly than low-income nations, with significant variation across historical periods. Key factors influencing re-access include the occurrence of natural disasters prior to the default, the presence of an IMF program, the severity of investor losses, the country's economic outlook, and global liquidity conditions. These findings contribute to the academic literature on sovereign defaults and inform the design of effective post-default support strategies by policymakers and international financial institutions.

JEL Classification: F21, F34, G15, H63

Keywords: sovereign default; market access; international capital markets; survival analysis

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†Board of Governors of the Federal Reserve System and CEMAPRE. Email: daniel.dias@frb.gov

‡International Monetary Fund. Email: crichmond@imf.org

§Berger Consulting Group. Email:gwestfahl@wesleyan.edu

1 Introduction

In this paper, we quantify the time it takes for a country to regain access to international capital markets following a sovereign default and its resolution and examine the factors that can accelerate or impede this process. This is a crucial issue because prolonged exclusion from international capital markets can impose significant economic and financial costs on a country. These costs are not merely theoretical; they have been empirically documented in various contexts. For example, Borensztein and Panizza (2009) highlight that sovereign defaults often lead to severe disruptions in capital flows, increased borrowing costs, and a long-term impact on economic growth, particularly as countries struggle to regain the trust of international investors. Similarly, Arteta and Hale (2008) emphasize the spillover effects of sovereign debt crises, showing how they can lead to significant contractions in credit availability not only for the public sector, but also for private-sector entities, thereby compounding the economic challenges faced by defaulting countries.

As Broner and Ventura (2011) argue, globalization facilitates risk-sharing across borders, enabling countries to better manage economic shocks. Consequently, exclusion from international markets not only leads to higher borrowing costs, but also reduces a country's capacity to hedge against future risks, potentially resulting in economic stagnation and heightened vulnerability to future crises. The importance of this research is further underscored by the existing macroeconomics literature on sovereign debt, which frequently assumes that defaulting countries face temporary or permanent exclusion from international capital markets. Additionally, it is motivated by the need for multilateral institutions, such as the International Monetary Fund (IMF) and other non-private lenders, to design balance of payment support policies based on accurate assumptions about the time required for countries to regain market access after a sovereign default.

The question of why countries repay their debts despite the challenges of enforcing sovereign debt repayment has been central to the theoretical literature on sovereign debt. Since sovereign states cannot be compelled to repay through traditional enforcement mechanisms, this raises the issue of why they can borrow in the first place.[1] The pioneering work by Eaton and Gersovitz (1981) posits that sovereigns repay their debts to maintain their rep-

[1]The prevailing notion that sovereign countries cannot be compelled to repay their debts faced a recent challenge. U.S. investors successfully sued the Argentinean government for its 2001 sovereign default, leading U.S. courts to enforce debt repayment for holdout investors by making it impossible for Argentina to pay other investors before paying the holdout investors (see Guzman (2020)). While this case is highly significant, it remains an exception rather than the rule. Notably, most sovereign debt issued by countries nowadays includes collective action clauses (CACs). These clauses facilitate extending debt restructuring agreements to all bondholders, even those who disagree with the terms of the restructuring.

utation and avoid the threat of a permanent embargo on future loans. However, empirical evidence shows that defaults do occur and that countries often manage to regain access to international capital markets afterward.

Building on this foundation, more recent models have allowed for sovereign defaults within equilibrium. Arellano (2008) and Yue (2010), for instance, incorporate the possibility of default and subsequent market exclusion into their frameworks. Arellano (2008) models re-access as a stochastic process independent of specific conditions, while Yue (2010) connects the duration of exclusion to a country's bargaining power. Other work, such as Benjamin and Wright (2009) and Mihalache (2020), explores how the terms of renegotiation and restructuring can affect the length of market exclusion. Notably, Thaler (2021) endogenizes the decision to re-borrow from international markets, emphasizing the complexity of market re-access post-default.

Our research extends this literature by providing empirical estimates of the duration of market exclusion and examining the factors that influence such outcomes. By focusing on the terms of debt restructuring, the role of multilateral institutions, and broader economic conditions, we offer a more nuanced understanding of the determinants of the duration of market exclusion following a default and resolution. This approach goes beyond theoretical predictions, offering results grounded in empirical analysis that will help other academic work in this area and inform policymaking and strategies of international financial institutions.

While the empirical literature has explored the determinants of market access, our study uniquely focuses on measuring the duration of market exclusion after the resolution of a sovereign default. Previous studies, such as Lensink and van Bergeijk (1991), have examined factors influencing a country's ability to access international capital markets during specific periods. However, these approaches often did not distinguish between a country's deliberate decision not to borrow and situations where borrowing was simply not possible. Similarly, Gelos et al. (2011) highlighted that factors such as vulnerability to shocks, policy quality, and institutional strength significantly impact market access. Fostel and Kaminsky (2007) explored whether volatile international capital markets drive the boom-bust pattern in Latin American capital market participation, finding that domestic (*pull*) factors were key drivers of market access for some countries, while external (*push*) factors were more influential for others.

Trebesch (2008) examined the delays in sovereign debt renegotiations, finding that the average duration from the onset of debt distress to the final renegotiation deal is about 2.5 years, largely driven by political instability and government actions rather than creditor holdout.

Our study builds on this literature by directly measuring the time between sovereign default resolution and a country's ability to borrow from international capital markets—regardless of whether the country chooses to borrow. We also emphasize the critical impact that the definition of market access has on the results related to exclusion duration, which has been underexplored in previous studies.

To understand the conditions and factors that either expedite or hinder re-access to international capital markets, we draw on the extensive literature on international capital flows to structure our empirical analysis. Specifically, we categorize these factors into country-specific (*pull*) and global (*push*) determinants, following the framework established by seminal works such as Calvo et al. (1993) and Calvo et al. (1996). These studies underscore the pivotal role of external push factors in driving capital flows, particularly to regions like Latin America and Asia. More recent research, including studies by Fratzscher (2012), Forbes and Warnock (2012), and Cerutti et al. (019a,b), further explores the relative importance of push and pull factors. Koepke (2019) synthesizes this body of research, concluding that push factors—such as global risk aversion and external interest rates—dominate portfolio debt and equity flows, while pull factors are more critical for banking flows.

Our findings align with this literature, demonstrating that both push and pull factors are crucial in determining the speed of market re-access. Although we do not directly measure their relative importance, our observation that market exclusion periods have shortened suggests that, in the current global macroeconomic environment, push factors may have an outsized influence on the speed of re-entry.

In addition to contributing to the macroeconomic literature on sovereign debt, our paper provides crucial insights into the duration of market exclusion, which serve as essential parameters for shaping country support policies. When countries default on their debt and consequently lose access to international capital markets, they often receive financial assistance from supranational institutions like the IMF. This support is designed to facilitate their transition toward a sustainable financial position. However, a key assumption underlying this assistance is that countries will regain the ability to borrow from international capital markets within a specific time frame. By refining our estimates of how long it takes for countries to regain borrowing capacity and identifying the factors that can either expedite or delay their re-entry into capital markets, we contribute to the more effective design of support packages.

More generally, while this paper primarily focuses on the duration of market exclusion following sovereign defaults, our analysis contributes to the broader literature on the aftermath

and consequences of financial crises. For example, Reinhart and Rogoff (2009) and Laeven and Valencia (2012) provide extensive analyses of the aftermath of banking crises, highlighting the prolonged economic stagnation and recovery challenges that countries face in the wake of such events. Similarly, Federico and Zettelmeyer (2006) examine the long-term consequences of sovereign debt crises, underscoring the enduring impact that financial disruptions—whether sovereign or banking-related—can have on a country's access to international capital markets.

The remainder of the paper is organized as follows. In section 2, we present the conceptual framework that we use as guide for the analysis. In section 3, we describe the data and the methodology. In section 4, we present and discuss aggregate results on the duration of market exclusion for the different measures of market access. In section 5, we estimate an econometric model of duration to allow us to do some counterfactual analysis. In section 6, we conclude.

2 Conceptual Framework

In this section, we introduce the conceptual framework that underpins our empirical analysis. We begin by explaining the notation used, followed by a presentation of essential definitions relevant to our analysis. Specifically, we delve into the definitions of market access and degree of market access, discussing the merits and drawbacks associated with each case.

2.1 Notation

Consider country i with total outstanding public and publicly guaranteed debt stock at the end of period $t-1$ equal to $B_{i,t-1}^{PPG}$. The outstanding debt stock, $B_{i,t-1}^{PPG}$, is the combination of debt owed to multiple lenders, of which some are official (denoted by superscript O) and others are private (denoted by superscript P) - $B_{i,t-1}^{PPG} = B_{i,t-1}^{PPG,O} + B_{i,t-1}^{PPG,P}$. During period t, country i contracts new debt equal to $b_{i,t}^{PPG} = b_{i,t}^{PPG,P} + b_{i,t}^{PPG,O}$, with superscripts P and O denoting again private and official creditors, respectively. During the same period t, country i repays creditors an amount equal to $c_{i,t}^{PPG} = c_{i,t}^{PPG,P} + c_{i,t}^{PPG,O}$; this amount includes both principal repayments and interest. Using this notation, we can write the evolution of overall, private, and official debt stocks as follows:

$$
\begin{aligned}
B_{i,t}^{PPG} &= B_{i,t-1}^{PPG} + b_{i,t}^{PPG} - c_{i,t}^{PPG} && (1)\\
B_{i,t}^{PPG,P} &= B_{i,t-1}^{PPG,P} + b_{i,t}^{PPG,P} - c_{i,t}^{PPG,P} && (2)\\
B_{i,t}^{PPG,O} &= B_{i,t-1}^{PPG,O} + b_{i,t}^{PPG,O} - c_{i,t}^{PPG,O} && (3)
\end{aligned}
$$

Focusing now only on borrowing from private creditors, which will be the main focus of our analysis, debt owed to private creditors can be divided further into debt in the form of commercial bank loans, $B_{i,t}^{PPG,P,CBL}$; debt in the form of bonds, $B_{i,t}^{PPG,P,Bon}$; and other forms of private debt, $B_{i,t}^{PPG,P,oth}$.[2]

$$
\begin{aligned}
B_{i,t}^{PPG,P} &= B_{i,t}^{PPG,P,CBL} + B_{i,t}^{PPG,P,Bon} + B_{i,t}^{PPG,P,oth} && (4)\\
b_{i,t}^{PPG,P} &= b_{i,t}^{PPG,P,CBL} + b_{i,t}^{PPG,P,Bon} + b_{i,t}^{PPG,P,oth} && (5)\\
c_{i,t}^{PPG,P} &= c_{i,t}^{PPG,P,CBL} + c_{i,t}^{PPG,P,Bon} + c_{i,t}^{PPG,P,oth} && (6)
\end{aligned}
$$

And debt dynamics for each of the three sub-types of private creditors follow dynamics as those defined in equation 1:

$$
\begin{aligned}
B_{i,t}^{PPG,P,j} &= B_{i,t-1}^{PPG,P,j} + b_{i,t}^{PPG,P,j} - c_{i,t}^{PPG,P,}\\
j &= \{CBL, Bon, oth\} && (7)
\end{aligned}
$$

Country i's private sector may also borrow from international markets, and we defined the outstanding debt stock, debt flows, and repayments in a similar manner to that of public and public guaranteed debt. To differentiate from the government debt, we use the superscript PS instead of the superscript PPG:

$$
B_{i,t}^{PS} = B_{i,t-1}^{PS} + b_{i,t}^{PS} - c_{i,t}^{PS} \quad (8)
$$

[2]We chose to focus only on borrowing from private creditors because our primary interest lies in a country's ability to borrow from private credit markets after a sovereign default episode. Borrowing from official creditors, such as the IMF or the World Bank, operates under different principles, which fall outside the scope of our investigation.

2.2 Definitions

A starting point for all the empirical work on sovereign default and sovereign default resolution is the definition of these concepts. While there is no single definition of sovereign default and sovereign default resolution, academics and practitioners have broadly converged on some key elements of what defines these two events. As such, most alternative definitions of these two concepts are very similar. In clear contrast, there is no widely accepted definition of market access (or the ability of countries to borrow from international capital markets). In this subsection, we first present the definitions of sovereign default and sovereign default resolution that we use in our analysis, and then we present our suggested definitions of market access, one of the main contributions of this paper.

2.2.1 Default and Resolution

According to Asonuma and Trebesch (2016), a sovereign default and sovereign default resolution are defined as follows:

Sovereign default: Sovereign default is the failure of a national government to repay its debts. It can manifest in two main ways:

- Technical Default: Brief delays in interest payments for specific bonds, which are usually resolved promptly without significant long-term consequences. For instance, the U.S. Treasury experienced a technical default in the 1970s, but it did not have lasting effects.
- Contractual Default: This is the more serious form of default. It occurs when a government willfully fails to make debt payments or requests creditors to change the original terms of the contracted debt.

In this paper, and also in the case of Asonuma and Trebesch (2016), we are mostly interested in the case of contractual default.

Sovereign default resolution: A country is said to have resolved its default when the government successfully completes the restructuring process, either preemptively or post-default, and meets its debt obligations according to the renegotiated terms and when the final agreement and/or the implementation of the debt exchange takes place.

Using these two definitions, Asonuma and Trebesch (2016) construct a data-set with the list of sovereign defaults since 1970, with the corresponding dating of the start and the end of the default episode. For the purpose of counting the time of market re-access, we start counting the number of years that it takes for a country to have access to international capital markets once the country has resolved its sovereign default.[3] For our analysis, we are mostly interested in the period after a sovereign default is considered resolved or, in other words, the country is not considered to be in default with its debt holders.[4]

2.3 Market Access Definitions

To properly understand and quantify the duration of a country's exclusion from international capital markets, we need to carefully define what constitutes "market access." In this paper, we distinguish between two dimensions of market access: *gross versus net flows* and the *degree of access* (partial versus full).

2.3.1 Gross vs. Net Market Access

Gross market access refers to the ability of a country to borrow from international markets; it is measured purely by the total amount of new debt issuance, regardless of repayments. In this case, the focus is on the total inflows of capital (i.e., gross borrowing). Mathematically, this can be expressed as

$$\frac{\sum_j b_{i,t}^{\text{PPG,P,j}} + b_{i,t}^{\text{PS}}}{\text{GDP}_{i,t}} > \delta, \quad j = \{\text{CBL, Bon, oth}\} \tag{9}$$

[3]We look only at the time from default resolution to regaining market access and not since the start of the default because, technically, a country does not have access to capital markets while in default. It is generally true that countries in default can't borrow in international capital markets, and while there are some exceptions, these are infrequent and therefore should not have a qualitative effect on our results. For a discussion on emerging markets' private-sector access to international debt markets during sovereign debt crises, see Arteta and Hale (2008) or Hale and Arteta (2009).

[4]These definitions of sovereign default and sovereign default resolution are very similar to those in Beers and Cavanaugh (2006). Beers and Cavanaugh (2006) define sovereign default as "the failure to meet a principal or interest payment on the due date (or within the specified grace period) contained in the original terms of a debt issue ... or tenders an exchange offer of new debt with less-favorable terms than the original issue," and they define sovereign default resolution as a situation in which "...no further near-term resolution of creditors' claims is likely."

where $b_{i,t}^{\text{PPG,P,j}}$ represents new borrowing from private creditors in category j, and $b_{i,t}^{\text{PS}}$ represents new private-sector borrowing. If the sum divided by GDP is greater than a threshold δ, the country is considered to have gross market access.

Net market access takes into account not only the new borrowing, but also the repayments made by the country. Here, market access is defined as the net inflow of capital after accounting for debt service (i.e., new borrowing minus repayments). This can be formulated as

$$\frac{\sum_j \max\{0, (b_{i,t}^{PPG,P,j} - c_{i,t}^{PPG,P,j})\} + \max\{0, (b_{i,t}^{PS} - c_{i,t}^{PS})\}}{GDP_{i,t}} > \delta, \quad j = \{CBL, Bon, oth\} \quad (10)$$

where $c_{i,t}^{\text{PPG,P,j}}$ and $c_{i,t}^{\text{PS}}$ represent repayments to private creditors and private-sector repayments, respectively. The net market access condition is met if the net borrowing divided by GDP is greater than the threshold δ.

Using only new borrowing to define market access is in line with the definition of market access used by Gelos et al. (2011), which looks at new bond or loan issuance that is public or publicly guaranteed. However, our suggested definitions of market access attempt to control for the country's demand for international credit, which we view as an important consideration. This is why we combine government or government-guaranteed borrowing with private-sector borrowing.

Example to Illustrate Net vs. Gross Market Access:

- *Gross Market Access:* A country borrows \$5 billion in a year from international capital markets. Under the gross access definition, the country is considered to have market access because it was able to secure new borrowing of \$5 billion, regardless of any repayments made during the same period.
- *Net Market Access:* In the same year, the country repays \$5 billion of its outstanding debt. Under the net access definition, this results in zero net borrowing (new borrowing minus repayments = \$5 billion - \$5 billion). Even though the country was able to borrow under the gross definition, it does not have net market access, as there was no net increase in borrowing—it merely repaid the same amount that it borrowed.

This example highlights that a country can have gross market access by borrowing new funds, but may not have net market access if the borrowing only covers repayments or if repayments

exceed the new funds borrowed. Gross access focuses on the ability to borrow, while net access reflects the ability to generate additional inflows after servicing debt obligations.

2.3.2 Degree of Market Access: Partial vs. Full

The **degree of market access** further refines our understanding by considering how much a country is able to borrow relative to its GDP. This dimension differentiates between *partial* and *full* access.

Partial market access refers to a situation where a country can borrow from international markets, but the borrowing amount is relatively small—specifically, a positive amount but less than 1% of its GDP. This level of access indicates that the country has some ability to secure international funding but is likely still constrained in its borrowing capacity. This corresponds to assuming a $\delta = 0$ in the formulas of gross and net access, equations 9 and 10, respectively.

Full market access, on the other hand, denotes a situation where a country can borrow more substantial amounts from international markets, specifically more than 1% of its GDP. This level of access suggests that the country may have largely overcome any barriers to borrowing and can secure reasonable amounts of funding. This corresponds to assuming a $\delta = 0.01$ in the formulas of gross and net access, equations 9 and 10, respectively.

Example to Illustrate Partial vs. Full Market Access:

- *Partial market access*: A country with a GDP of \$200 billion borrows \$0.8 billion. Although it can access international capital markets, the amount is limited, representing less than 1% of its GDP.
- *Full market access*: If the same country borrows \$3 billion, this represents more than 1% of its GDP, indicating significant access to international markets.

While the choice of $\delta = 0$ is fairly straightforward, the choice of $\delta = 0.01$ is more ad-hoc and individual preference-based. Ideally, the definition of full market access should be country-specific and based on that particular country's characteristics and needs. However, this is difficult to implement in practice because there is no single way of achieving such a goal, and many alternative possibilities exist. For example, the threshold used for full market access could be based on the borrowing levels during "normal times". But what are "normal times" for most of the countries that have defaulted in the past 40 years? As noted by Aguiar and

Gopinath (2007), the idea of normal and abnormal times for emerging countries is blurred because of the volatile macroeconomic (and other) conditions in these countries. Another possibility would be trying to estimate a country's financing needs, but these financing needs are not independent of a country having market access, and therefore the estimation of such a value would be very difficult, if not impossible, to achieve.

Importantly, while the numerical results depend on the choice of δ, the qualitative results are much less affected by this choice. To give an idea of how important the value for δ is for our numerical results, in Appendix B we provide results for values of $\delta = 0, 0.005, 0.01, 0.02$ and show that for the cases considered, our conclusions remain unchanged.

By distinguishing between these different types and degrees of market access, we can better understand the nuances of how and when countries regain the ability to borrow from international markets after a sovereign default. As the results will show, these distinctions matter not only for measuring the duration of market exclusion, but also for informing the design of strategies to help countries re-access global capital markets. Understanding these dynamics can guide policymakers and international organizations in crafting more effective interventions that support a country's re-entry into international finance, thus shortening the duration of market exclusion and mitigating the economic costs associated with prolonged isolation from global capital flows.

3 Data and Methodology

This section presents the data used in the analysis and how we used these data to construct the variable of interest as well as other variables.

3.1 Data

To measure capital flows, we use the publicly available data on public and publicly guaranteed debt stocks and debt flows produced by the World Bank and made available through its annual International Debt Report. This report also has information on private-sector external debt capital flows. In addition to these debt stock and debt flow data, we also use GDP data.[5] These data, combined with the sovereign default data from Asonuma and

[5]For more details on these and other data used in the paper, please see Appendix A.

Trebesch (2016), are the basis for the construction of the time it takes for countries to regain access to capital markets following a sovereign debt default and resolution.

In addition to the capital flows data, we also use other data to better understand what factors play a role in the duration of market exclusion following a sovereign debt default and corresponding resolution. Namely, we use the World Bank's classification of a country's development stage, the Institutional Investor's Rating (IIR), measures of liquidity, levels of interest rates, a measure of democracy, and information on previous IMF assistance programs. In Appendix A we provide more detailed information for each of the variables, and we also discuss how we managed some missing information for some of the variables we use.

3.2 Methodology

The variable of interest in the paper is the time between two events—namely, between a country resolving a sovereign default and being able to borrow again from international capital markets. One issue that makes the study of time between events different from other more common analyses is that some episodes are censored—in other words, the full duration of the events is not entirely observed. Events may be partially observed because the start of the event is not observed (left censoring), the end of the event is not observed (right censoring), or both the start and end of the episode are not observed (left and right censoring). To study the time between the resolution of the default and a country having access again to international capital markets, we use duration analysis techniques, which, among other things, allows us to deal with the main problems arising from censoring. This is important because the incorrect treatment of censored observations leads to biases in the results.[6]

As noted in the previous sub-section, we use annual data, which makes the unit of measurement of time the year. One consequence of using annual data is that there will be some measurement error because we only consider the years in which the events (exiting default or accessing credit markets) happen. For a matter of convention and interpretation, we assume that countries resolve default events at the start of the year and market access only occurs at the end of the period. One consequence of this assumption is that a country that has market access immediately after the resolution of the sovereign default will show in our data as having taken one year to regain market access. In practice, this is not too important

[6]If the duration of all episodes was always observed, we could simply use ordinary least squares or other similar econometric approaches—see Lancaster (1990). However, because these more standard econometric approaches are not well suited to deal with censored data, they should not be used.

because our results can be interpreted as an upper bound for the true duration of exclusion. Moreover, it should have only a marginal effect on the relative ordering of events by duration of exclusion.

In the analysis we first show duration of exclusions statistics based on an unconditional non-parametric approach, which allows us to present a set of stylized facts, and then we resort to regression analysis, or conditional approach, to help us tease out which factors are most important for the speed of market re-access.

In duration analysis there are two very important concepts—survival function, $S(t)$, and hazard function, $\lambda(t)$. The survival function tells the percentage of events that have not yet ended for a given duration of the event. The hazard function provides information of an event ending at a given duration conditional on having not ended before. More formally, let T be a continuous random variable with probability distribution function (p.d.f) $f(t)$ and cumulative probability distribution (c.d.f.) $F(t)$, the survival ($S(t)$) and hazard ($\lambda(t)$) functions of the random variable T are

$$S(t) = Pr(T >= t) = 1 - F(t) \tag{11}$$

$$\lambda(t) = \lim_{x \to 0} \frac{Pr(t <= T < t + x | T >= t)}{x} = \frac{f(t)}{S(t)} \tag{12}$$

While T, the duration of a given event, is by definition always a continuous variable, it is sometimes useful to treat it as a discrete variable. In this case, the survival function is the same as in the continuous case, but the definition of the hazard function needs to be adjusted to account for discrete time:

$$\lambda(t_j) = Pr(T = t_j | T >= t_j) = \frac{S(t_j) - S(t_{j+1})}{S(t_j)}, \quad j = 1, 2, 3, ... \tag{13}$$

The expression in equation 13 can be used to write the survival function in terms of the sequence of hazard ratios:

$$S(t_j) = \prod_{i=1}^{j-1} (1 - \lambda(t_i)), \quad j = 1, 2, 3, ... \tag{14}$$

The expression in equation 14 is going to be useful for the specification of the duration econometric model we plan to use in the empirical application. In particular, we use a proportional hazard model with a piece-wise constant hazard in which we take into consideration that we observe the data in intervals (years) and that certain country and global conditions change over time (i.e., time-varying covariates). While, in principle, we could have used the Cox methodology for estimating the proportional hazard model, we opted for the piece-wise hazard specification because it will allow us to estimate the hazard function, an object we are interested in analyzing, and will also allow us to conduct some basic counterfactual analysis. In addition, we also want to account for unobserved heterogeneity, an issue that can bias many of the estimates of interest (see Heckman and Singer (1984) or Lancaster (1990)). The econometric model we use is similar to that used in Dias et al. (2007) to study the duration of price spells. The econometric model used is defined as follows:

1. Baseline hazard:

$$\lambda(t) = \begin{cases} \lambda_1 & \text{if } t \in [0, t_1] \\ \lambda_2 & \text{if } t \in (t_1, t_2] \\ \dots & \\ \lambda_{j-1} & \text{if } t \in (t_{j-1}, t_j] \\ \lambda_j & \text{if } t > t_j \end{cases} \tag{15}$$

2. Survival function

$$S(t|X_t, \delta) = Pr(T \geq t|X_t, \delta) = exp(-\Lambda(t)exp(X_t\beta)\delta) \tag{16}$$

The term $\Lambda(t)$ in equation 16 is the cumulative baseline hazard function and is defined as $\Lambda(t) \equiv \int_0^t \lambda(i)di$; β is a vector of parameters associated with the covariates in X_t; and δ is a random variable with distribution Gamma that accounts for unobserved heterogeneity (this is also known as frailty, which is similar to a random effects model). Without loss of generality, we assume that $E[\delta] = 1$. After integrating out the unobserved heterogeneity, we obtain the marginal survival function with respect to the unobserved heterogeneity δ.[7]

3. Marginal survival function:

$$S(t|X_t) = Pr(T \geq t|X_t) = (1 + \sigma^2\Lambda(t)exp(X_t\beta))^{-\sigma^{-2}} \tag{17}$$

[7]For more details on this model, see Lancaster (1990).

To account for time-varying covariates and the fact that we observe data at an annual frequency, the individual contribution to the likelihood function of each market exclusion spell needs to be adjusted.

4. Individual contribution to the likelihood function:

$$l_i(\beta, \sigma | X_{i,t}) = \prod_{j=1}^{T} \left[\frac{S(j-1|X_{i,j})}{S(j|X_{i,j})} \right]^{(1-d_{i,j})} \left[\frac{S(j-1|X_{i,j}) - S(j|X_{i,j})}{S(j-1|X_{i,j})} \right]^{d_{i,j}} \tag{18}$$

The variable $d_{i,j}$ is an indicator variable that takes the value 0 if spell i does not end after j periods and takes the value 1 if spell i ends after j periods. Note that, for censored spells, $d_{i,j} = 0$ for all periods, whereas a complete spell of duration T is a sequence of $T-1$ zeros followed by a 1 at the end. This specification is equivalent to considering a sequence of right and left censored spells for which we observe the variables X_t at each period.[8]

4 Aggregate Results on Duration of Market Exclusion

This section presents aggregate results about market exclusion duration, based on the four access definitions previously introduced. Each table displays the proportion of cases where capital market access took one year ($F(1)$), along with the median and quartiles of the market exclusion time distribution.[9] Data limitations prevent full statistic estimation in some cases, so we provide the largest estimable lower bound. We also include Kaplan-Meier estimates of survival functions for market exclusion duration. Despite overlapping information, we present both tables and charts to highlight key results and illustrate the full distribution of the time for re-accessing capital markets across different access definitions and country groups.

1. **The definition of market access is of first-order importance for the quantification of the duration of market exclusion. Depending on the definition of market access, periods of market exclusion can be very short or very long.**

Table 1 reveals that the duration of exclusion from capital markets crucially hinges on the definition of access, as different definitions can yield vastly different exclusion periods. Using

[8] For a more detailed discussion on this model specification, please see Jenkins (2008) or Dias et al. (2007).

[9] We don't display the average exclusion duration due to the impossibility of estimating it from censored data without assuming an underlying duration distribution.

partial gross access as a measure, countries can re-enter international capital markets almost immediately post-sovereign default resolution. Conversely, with net full market access as the measure, the median exclusion duration extends to 11 years. This underscores the significance of the access type considered for policy and modeling purposes.

Table 1: Duration of capital market exclusion - aggregate results.

	Partial Access		Full Access	
	Gross	Net	Gross	Net
1^{st} Quartile	1	1	1	3
Median	1	2	3	8
3^{rd} Quartile	2	6	15	16
F(1)	.68	.38	.43	.16
Nr. of Events	148	144	148	144

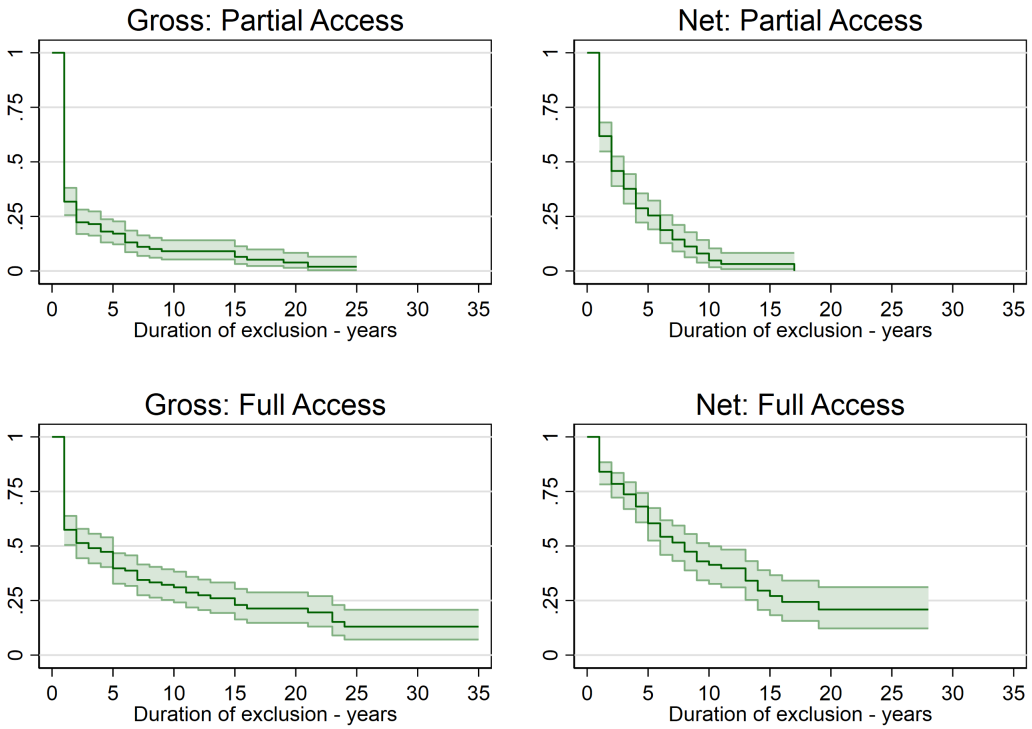
Note: Entries in the first 3 rows of the table are number of years between sovereign default resolution and market access. Row number 4, $F(1)$, is the percentage of countries that regained access to capital markets in the first year after sovereign default resolution. These statistics are an upper bound for the duration of exclusion because the aggregate borrowing data are annual.

In our view, net access results are highly pertinent to international macro literature. Most models use a one-period bond (B_t), where a negative value signifies the country as a net-international lender and a positive value as a net-international borrower. In non-default scenarios, net borrowing is the difference between repayment amount and new gross borrowing. This common setting aligns well with our net-market access definition, which necessitates the country to be a net-international borrower for market access.

Results based on net and gross access are policy-relevant, contingent on the policies under consideration. For instance, when the IMF formulates a program for a country's external sustainability, it must assume the country's future borrowing capacity from international markets. Both gross and net market access results can inform the design of such programs, depending on the borrowing needs outlined in the IMF program.

The results based on net and full access, give an idea of how long it may take for a country to be able to borrow more substantively from international capital markets. As expected, for both gross and net market access, the duration of market exclusion is notably longer for full than partial market access. While the median duration of exclusion based on partial access is 1 and 2 years for gross and net access, respectively, in the case of full access this number rises to 3 and 8 years for gross and net access, respectively. This result can be seen very clearly in the empirical survival functions for each of the four definitions of access shown in Figure 1.

Figure 1: Duration of market exclusion survival function for the four definitions of market access.



Note: The figure shows the Kaplan-Meier estimates of the survival function ($S(t)$) of the duration of market exclusion for each of the four definitions of market access. The solid line corresponds to the point estimate of the survival function, while the shaded areas are the 90% confidence interval.

2. **The duration of market exclusion is substantially longer for low-income countries than for middle-income countries.**

As shown in Table 2, following a sovereign default and corresponding resolution, low-income countries are excluded from international markets for much longer periods than middle-income countries. While the relative difference is not surprising, the absolute difference between the duration of exclusion for low-income relative to middle-income countries is quite staggering. For example, based on net full market access, the median duration of market exclusion for middle-income countries is 7 years, while for low-income countries it is 21 years.

The results from Table 2 are also clearly visible in Figure 2, with the survival function for middle-income countries systematically below that of low-income countries for all four definitions of market access, which means that the probability of not having regained access

Table 2: Duration of capital market exclusion by income level.

	Partial Access		Full Access	
	Gross	Net	Gross	Net
Panel A: Low Income				
1^{st} Quartile	1	1	1	6
Median	1	2	8	13
3^{rd} Quartile	6	8	23	19
F(1)	.56	.33	.25	.091
Nr. of Events	59	55	59	55
Panel B: Middle Income				
1^{st} Quartile	1	1	1	2
Median	1	2	1	6
3^{rd} Quartile	1	4	7	13
F(1)	.76	.42	.54	.2
Nr. of Events	89	89	89	89

Note: Entries in the first 3 rows in panels A and B in the table are the number of years between sovereign default resolution and market access. Row number 4, $F(1)$, is the percentage of countries that regained access to capital markets in the first year after sovereign default resolution. These statistics are an upper bound for the duration of exclusion because the aggregate borrowing data are annual.

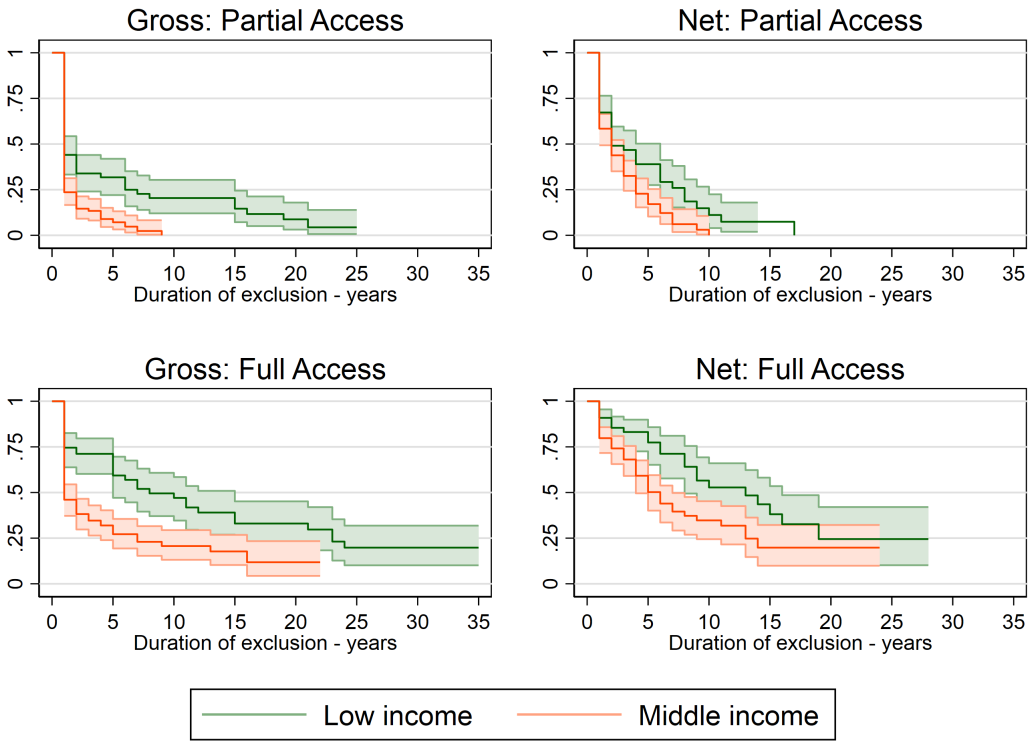
after a given number of years is always higher for low-income countries than for middle-income countries.

If being able to borrow from international capital markets is important for sustainable growth, then low-income countries are highly penalized from a sovereign default. However, it may be the case that low-income countries don't use the borrowed funds properly, and it may be better that these countries don't have full access to international capital markets and most of their borrowing is done through international organizations such as the World Bank or other similar development banks.

Since the results are so different for low- and middle-income countries, in the rest of the analysis we will make sure that our results are not driven by an over- or under-representation of the two groups of countries.

Being considered a low- or a middle-income country is mostly driven by economic factors, such as income per capita; however, the lower income per capita is just a symptom of other structural factors. We view this large difference of results between low- and middle-income countries as an indication that country-specific factors, also known as *pull* factors, are important determinants of market access. We explore the relationship between the duration of market exclusion and some well-established pull factors of capital flows in the next section.

Figure 2: Duration of market exclusion survival function by income level for the four definitions of market access.



Note: The figure shows the Kaplan-Meier estimates of the survival function ($S(t)$) of the duration of market exclusion for each of the four definitions of market access by level of income. The solid line corresponds to the point estimate of the survival function, while the shaded areas are the 90% confidence interval.

3. **Market exclusion periods have shortened over time. Defaults resolved in the 1980s and 1990s resulted in longer periods of market exclusion compared to those episodes resolved after 2000.**

As shown in Table 3, sovereign default episodes resolved before the year 2000 led to significantly longer periods of market exclusion compared to those resolved after that year.[10] Importantly, this finding is consistent even when considering low- and middle-income countries separately. Taken together, it suggests that countries defaulting on their debt are no longer as severely penalized through extended exclusion from international capital markets as in the past.[11]

[10]The choice of the year 2000 to split the sample is somewhat ad-hoc, but, it roughly corresponds to an even split of the sample period and it also corresponds to the change of the millennium.

[11]These results are not driven by a composition effect of low- and middle-income countries in the two periods. In Appendix B we show results for low- and middle-income countries separately, and the conclusions are broadly the same for the two groups of countries.

Table 3: Duration of capital market exclusion by date of the sovereign default resolution.

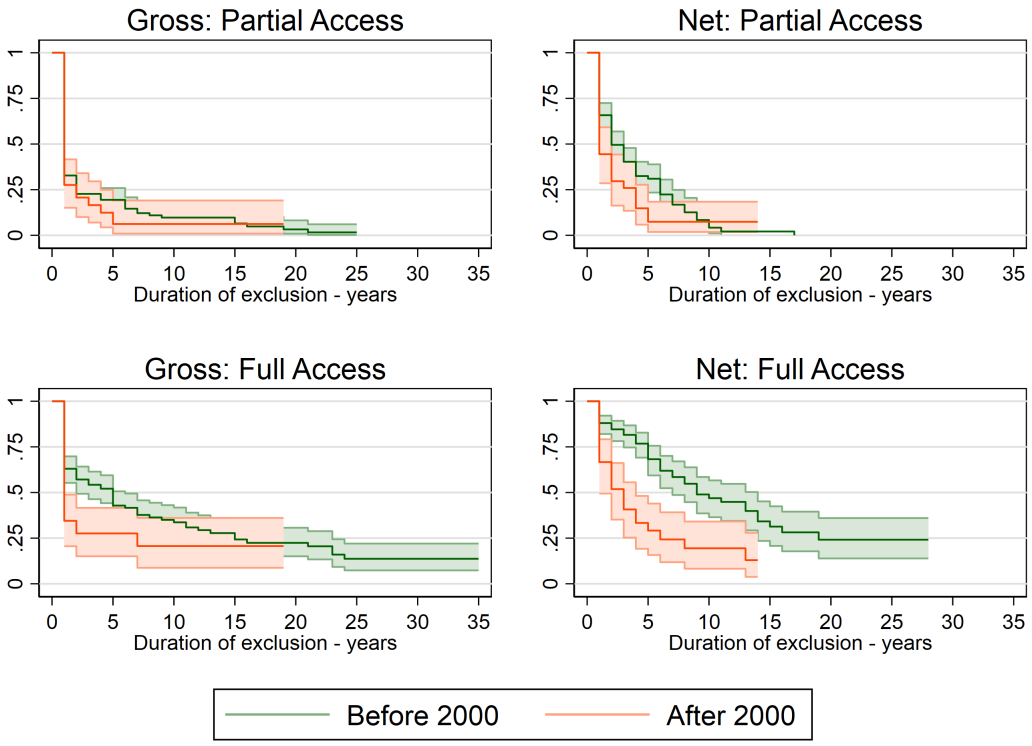
	Partial Access		Full Access	
	Gross	Net	Gross	Net
Panel A: Before 2000				
1^{st} Quartile	1	1	1	5
Median	1	2	5	9
3^{rd} Quartile	2	6	15	19
F(1)	.67	.34	.37	.12
Nr. of Events	119	117	119	117
Panel B: After 2000				
1^{st} Quartile	1	1	1	1
Median	1	1	1	3
3^{rd} Quartile	2	4	7	6
F(1)	.72	.56	.66	.33
Nr. of Events	29	27	29	27

Note: Entries in the first 3 rows in panels A and B in the table are the number of years between sovereign default resolution and market access. Row number 4, $F(1)$, is the percentage of countries that regained access to capital markets in the first year after sovereign default resolution. These statistics are an upper bound for the duration of exclusion because the aggregate borrowing data are annual.

The results in Table 3 raise the question of what may explain such a dramatic change in the patterns of market exclusion in recent years relative to the 1980s and 1990s. Since this sample split concerns changes that occurred over time and that affected all countries in similar patterns, the most likely explanation is that global factors drive this result. For example, it has been widely documented that very low risk-free interest rates in most developed countries during part of the 2000s and most of the 2010s may have prompted investors to reach for yield. One form of reaching for yield would be for investors to be more willing to take risks and lend to countries that had defaulted on their debt.

The results of Table 3 are also confirmed by those of Figure 3. In this figure, it is clear that defaults resolved before the year 2000 take more time to re-access international capital markets than those defaults that were resolved after the year 2000. For the four definitions of market access, the green line, which represents cases of defaults resolved before 2000, is above the orange line, which represents cases of defaults resolved on or after 2000, meaning that the probability of not having regained access after a certain number of years is higher for those defaults resolved before the year 2000 then after.

Figure 3: Duration of market exclusion survival function by date of the sovereign default resolution for the four definitions of market access.



Note: The figure shows the Kaplan-Meier estimates of the survival function ($S(t)$) of the duration of market exclusion for each of the four definitions of market access by year of sovereign default resolution. The solid line corresponds to the point estimate of the survival function, while the shaded areas are the 90% confidence interval.

5 An Econometric Model of Market Access

To gain some insights about which factors matter for the speed of market re-access, we estimate the econometric model described in section 3 (equations 15, 16, and 17). We consider the four definitions of market access and two specifications with different explanatory variables in the estimation of the model. In the first specification, which we will refer to as the "basic specification," we include variables to control for event-specific characteristics and dummy variables for income level (or level of development) and when the default event was resolved. This specification will be more closely related to the aggregate results we presented in the previous section, but in this case we add episode-specific characteristics to gain additional insight regarding the variation of duration of exclusion for different episodes.

The second specification, which we refer to the "push-pull specification," also includes variables to control for event-specific characteristics, but we replace the income level and the time of default resolution dummy variables with variables that represent push and pull factors (as normally defined in the literature). We exclude the income level and the time of default dummy variables in the push-pull specification because these two variables have important information concerning push and pull factors, which we are interested in learning more about. Namely, the income level is mostly a symptom of other characteristics that matter for investors, and the time of default is likely capturing global changes in important push factors such as developed countries' monetary policy stance or risk appetite

5.1 Basic Model Results

Table 4 shows the results for the case with only default-specific variables and broad country and global factors. The default-specific variables include information about the occurrence of a natural disaster prior to the sovereign default, whether there was an IMF program during the resolution period, the size of investor losses as estimated by Cruces and Trebesch (2013), and whether the default was preemptive as defined by Asonuma and Trebesch (2016).

One of the first things to note from the results in Table 4 is that the effects of the different variables vary with the definition of market access. In general, there are fewer statistically significant results for the two definitions of partial market access than for the two definitions of full market access. Based on the result of the previous section, access to international capital markets tends to be faster in the case of partial market access than in the case of full market access, and, in some cases, there is almost no period of exclusion, which creates a situation of less variation to be explained. On the contrary, for the case of full market access, there is significantly more heterogeneity, and, in this case, there are many more statistically significant factors.

Starting with the occurrence of natural disaster prior to the default episode, the results in Table 4 show that for all four definitions of market access, cases that were preceded by a natural disaster, on average, regain market access faster than those cases that were not preceded by a natural disaster. However, only in the cases of full market access is the effect statistically significant. We interpret this result as suggesting that investors take into account the conditions that may have caused the country to default, and that in cases of a natural

Table 4: Estimation results - basic model specification.

	Gross Access		Net Access	
	Partial	Full	Partial	Full
Natural disaster before default	0.41	1.95	0.22	1.24
	(1.33)	(2.88)***	(0.99)	(2.97)***
IMF program during resolution	0.50	1.10	0.21	0.40
	(1.46)	(1.92)*	(0.89)	(0.94)
Size of haircut (Cruces and Trebesch (2013))	-1.30	-2.86	-0.47	0.18
	(2.08)**	(2.31)**	(1.00)	(0.23)
Preemptive default (Asonuma and Trebesch (2016))	-0.23	-0.37	-0.21	-0.41
	(0.63)	(0.60)	(0.74)	(0.87)
Middle-income country	0.45	1.27	0.32	0.80
	(1.41)	(2.36)**	(1.32)	(1.90)*
Resolution in or after 2000	0.83	2.92	0.46	1.09
	(1.78)*	(2.74)***	(1.39)	(2.15)**
λ_1	0.02	-1.51	-1.15	-3.75
	(0.04)	(1.89)*	(3.52)***	(5.16)***
λ_2	-1.75	-1.91	-1.69	-3.76
	(2.24)**	(1.99)**	(4.39)***	(5.19)***
λ_3	-1.67	-1.21	-1.08	-3.42
	(2.18)**	(1.07)	(2.43)**	(4.57)***
Frailty distribution parameter - γ	0.28	1.85	0.00	0.49
LL test $\gamma = 0$	1.18	14.67	-0.00	1.29
P-value LL test	0.14	0.00	0.50	0.13
Nr. events	123.00	127.00	123.00	125.00

Note: The table shows estimation results of equation 17 for each of the four definitions of market access presented and discussed in section 2. The number of events varies across specifications because of differences in availability of explanatory variables. For comparison purposes, the estimation results in this table and Table 5 are based in the same sample. Parameters λ_j correspond to the baseline hazard pieces as defined in equation 15. The parameter γ corresponds to the variance of the Gamma distribution of unobserved heterogeneity. The LL-test $\gamma = 0$ entry is the result of the log-likelihood test of $\gamma = 0$, and the P-value LL test entry is the corresponding p-value of the test. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

disaster having occurred prior to the default investors tend to penalize countries less (that is, some defaults may be more excusable than other).[12]

Turning now to the effect of an IMF program during the period of the default resolution, the point estimates of the effect are all positive, meaning that, on average, cases where there was an IMF program tend to take less time to regain market access after the default is resolved. In this case, however, only in the case of gross full market access is the effect statistically significant. This result does not allow for a causal interpretation, but it is somewhat reassuring that when there is an IMF program, the country does not fare worse than when there isn't a program. This finding relates to the results in Corsetti et al. (2006) and Kogan et al. (2024). In their analysis of the IMF's role in facilitating access to international lending, Corsetti et al. (2006) argue that while IMF programs can indeed accelerate re-access to markets, they also introduce potential risks of moral hazard, as countries might be incentivized to rely on IMF assistance rather than implementing necessary fiscal reforms. This nuanced view is echoed by Kogan et al. (2024), which underscores the effectiveness of IMF arrangements in restoring market access while also emphasizing the importance of balancing immediate recovery with sustainable fiscal policies. Our results corroborate these findings, showing that countries with IMF support programs tend to experience shorter periods of market exclusion. However, while the effectiveness of IMF arrangements in restoring market access is evident, it is crucial to balance these short-term effects with the long-term goal of sustainable fiscal policies.

The next variable is the size of the haircut, as estimated by Cruces and Trebesch (2013). For this variable, the results suggest that in the case of gross access, both partial and full, and net access partial, a higher haircut (meaning a higher loss for investors) increases the time to regain market access. This result is in line with the findings of Cruces and Trebesch (2013), which are based on a measure of market access similar to the gross access measures used in our paper. In contrast, for the case of net full access, the point estimate of the effect of the size of the haircuts is positive but statistically insignificant. This result may be somewhat counterintuitive, as it suggests that investors don't penalize countries that impose larger losses. However, because the definition of net full access is quite demanding, it may simply mean that other factors, especially forward-looking ones, may be more important determinants of market access than the size of the losses endured by investors.

[12]Note that this result does not contradict the findings in Mallucci (2022), who provides evidence that countries that are subject to higher climate risk face higher difficulties in issuing debt. Our result only suggests that for countries that were able to issue debt despite their higher climate risk, once they are hit by a climate-related shock they are able to regain market access faster likely because markets understand that the default was less likely to be strategic and therefore more excusable.

Asonuma and Trebesch (2016) study cases of sovereign defaults in which countries act preemptively and try to avoid surprising markets before negotiating their sovereign debt. It could be expected that in such cases, markets would treat countries a little better and provide access faster as a reward. However, the results in Table 4 suggest that the duration of exclusion is basically the same for cases where there was a preemptive default and for cases where the default was not preemptive. Whether a default is preemptive or not is not random, and as such it is not possible to establish any causal relationship, but it is somewhat surprising that markets do not seem to distinguish between the two cases.

The two remaining variables to be discussed are a dummy variable indicating whether the country is middle-income (with the alternative being that the country is a low-income country) and a dummy variable indicating whether the default episode was resolved before the year 2000 or after. These two results are directly linked with the results in Tables 2 and 3 and Figures 2 and 3, respectively.

For the case of level of income variable, similar to the results in section 4, we find that, on average, middle-income countries are able to regain market access faster than low-income countries. However, this result is only statistically significant for the cases of full market access, gross and net. As for the dummy variable indicating if the default resolution occurred before or after the year 2000, for all definitions of market access, market re-access was faster if the default was resolved after the year 2000, and the result is statistically significant in all four cases.

5.2 Push-Pull Model Results

To gain some more insight as to why income level and when the default resolution occurred matter for the duration of exclusion, we replace the two dummy variables for income level and when the default was resolved that we used in the basic model with country-specific information (or pull factors) and variables pertaining to the global economy (or push factors). In addition to the push and pull variables, we also include the five default-specific variables as in the basic model.

As pull factors, we use a catch-all measure of a country's macroeconomic outlook, the IIR, and a widely used measure of political regime (from most autocratic to most democratic), polity2. As push factors, we use the federal funds rate, which can be seen as a proxy for global liquidity, and the spread between medium-risk private-sector bonds (BAA) and the 10-year Treasury yield, which can be seen as a measure of global risk-taking (a higher/lower

spread indicates lower/higher willingness to take risk).[13] The estimation results based on this specification are presented in Table 5.

Similar to what we had found in the basic model, the effects of the variables on the time of exclusion varies with the definition of market access. Also, in general, there are more statistically significant variables in the models pertaining to the measures of full market access than the models of partial market access. Regarding the variables pertaining to default-specific characteristics, the results in the push-pull model are qualitatively very similar to those found in the basic model, and as such there is no need for any additional discussion of these results.

Turning first to the pull factors, the results in Table 5 show that both IIR and the polity2 rating have a statistically significant effect on the duration of market access for some of the definitions of market access. A higher IIR rating, which corresponds to a more favorable investment environment, reduces the duration of market exclusion in the cases of full access; for the definitions of partial access, the effect is also positive but not statistically significant. In the case of polity2, we find that more democratic regimes (higher value of polity2) tend to regain market access faster. This effect is statistically significant for the gross-full, net-partial, and net-full access.

As for the push factors, the results are mixed. First, the interest rate spread variable is not statistically significant for any of the definitions of market access, and the sign of the estimated effect is different for gross and net access. In the case of the federal funds rate, this variable has no effect in the case of gross access, but it has a negative and statistically significant effect in the case of net access. The stark difference in results for the federal funds rate suggests to us that global liquidity may be more relevant for cases where countries need to borrow more from international capital markets than what they pay back from previous borrowings.

[13]Note that these are not the only variables relevant for measuring push and pull factors of international capital flows. We chose to only use a small number of variables because the number of countries covered in the sample makes it difficult to find variables that cover a large portion of the sample period. Moreover, the sample of default events is relatively small, and therefore for statistical power reasons we kept the model parsimonious.

Table 5: Estimation results - push-pull model specification.

	Gross Access		Net Access	
	Partial	Full	Partial	Full
Natural disaster before default	0.28	1.92	0.16	1.42
	(0.86)	(2.42)**	(0.70)	(2.66)***
IMF program during resolution	0.54	1.31	0.30	0.88
	(1.52)	(2.09)**	(1.28)	(1.47)
Size of haircut (Cruces and Trebesch (2013))	-1.13	-2.37	-0.79	-0.38
	(1.67)*	(1.86)*	(1.76)*	(0.36)
Preemptive default (Asonuma and Trebesch (2016))	-0.27	-0.49	-0.24	-0.55
	(0.68)	(0.73)	(0.89)	(0.82)
Institutional Investors' Rating	0.02	0.06	0.01	0.08
	(1.01)	(1.78)*	(1.00)	(2.23)**
Polity2 rating	0.03	0.11	0.05	0.12
	(1.43)	(2.64)***	(2.89)***	(2.59)***
Federal Funds Rate	-0.01	0.02	-0.11	-0.21
	(0.10)	(0.26)	(2.96)***	(2.41)**
Spread BAA to 10yr Treasury	0.10	0.12	-0.08	-0.40
	(0.37)	(0.39)	(0.65)	(1.25)
λ_1	-0.26	-2.40	-0.28	-3.28
	(0.22)	(1.56)	(0.54)	(2.08)**
λ_2	-2.11	-3.12	-0.93	-3.26
	(1.58)	(1.92)*	(1.64)	(2.08)**
λ_3	-2.15	-2.89	-0.54	-3.07
	(1.63)	(1.66)*	(0.84)	(1.91)*
Frailty distribution parameter - γ	0.33	2.24	0.00	1.86
LL test $\gamma = 0$	1.65	16.93	-0.00	7.08
P-value LL test	0.10	0.00	0.50	0.00
Nr. events	123.00	127.00	123.00	125.00

Note: The table shows estimation results of equation 17 for each of the four definitions of market access presented and discussed in section 2. The number of events varies across specifications because of differences in availability of explanatory variables. For comparison purposes, the estimation results in this table and Table 4 are based on the same sample. Parameters λ_j correspond to the baseline hazard pieces as defined in equation 15. The parameter γ corresponds to the variance of the Gamma distribution of unobserved heterogeneity. The LL-test $\gamma = 0$ entry is the result of the log-likelihood test of $\gamma = 0$, and the P-value LL test entry is the corresponding p-value of the test. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

5.3 Quantifying the Effect of Different Factors on the Duration of Market Exclusion

To quantify the relative importance of each factor included in the push-pull model, we use the estimated model to calculate the effect of each variable on the duration of market exclusion. For this purpose, we calculate the probability of regaining access in the first year after resolution ($F(1)$) for the given baseline level of the covariates, and then we change each of the variables one a time and recalculate this probability. To compare the two results—the baseline and the "shocked" probabilities—we compute the log-odds ratio of the non-baseline figure to the baseline figure. Table 6 shows the results of this exercise.[14]

Table 6: Simulated probability of regaining market access in the first year after default resolution.

	Partial Access		Full Access	
	Gross	Net	Gross	Net
Baseline	0.63	0.35	0.27	0.07
Natural disaster before default	0.13	0.13	0.81	1.15
IMF program during resolution	0.22	0.23	0.62	0.75
Size of haircut (Cruces and Trebesch (2013))	-0.17	-0.18	-0.44	-0.1
Preemptive default (Asonuma and Trebesch (2016))	-0.14	-0.2	-0.32	-0.51
Institutional Investors' Rating	0.11	0.1	0.39	0.82
Polity2 rating	0.07	0.18	0.28	0.49
Federal Funds Rate	-0.02	-0.37	0.05	-0.79
Spread BAA to 10yr Treasury	0.03	-0.04	0.05	-0.23

Note: The table shows the estimated baseline probability of a country regaining market access in the first year after default resolution based on the model of equation 17 and parameter estimates shown in Table 5 and the log-odds ratio for the same probability when each of the variables is changed one at a time. The baseline value considers the case where there was no natural disaster prior to the default event, there was no IMF program during resolution, the default was not preemptive, the sample averages of the size of haircuts (40%), the IIR (29.9), the polity2 rating (3.7), the federal funds rate (4.9%), and the BAA to 10yr Treasury spread (2.3%). Each of the rows below the baseline shows the individual effect of the variable on the estimated probability in terms of an odds ratio. Relative to the baseline, we consider the case of a natural disaster having occurred prior to the default event, and IMF program taking place during the resolution period, and that the default was preemptive. For the other variables, we consider the effect of adding the standard deviation of that variable to its mean (the standard deviations of the size of haircut, IIR, polity2 rating, federal funds rate, and the BAA to 10yr Treasury spread are 28%, 12.1, 4.6, 4.1%, and 0.6%, respectively).

From the results in Table 6, and as could be expected from the results in this and the previous sections, there are large differences in the probability of regaining market access

[14]The odds ratio is simply the ratio of two probabilities. One issue with this metric is that it is bounded from below but can take extremely large values from above. To adjust for this asymmetry, it is common to use the log-odds ratio, which is unbounded from below and above.

in the first year after the default resolution across definitions of market access. Based on the least demanding definition, gross partial access, the probability of regaining access in the first year after resolution is 63%, while it is only 7% in the case of the most demanding definition of market access, net full access. For the results of the various variables, we won't comment on all of them, but we will just highlight a few.

Turning now to the results for each of the variables, the results of Table 6 show that defaults preceded by a natural disaster or that had an IMF program during the resolution period lead to much higher probabilities of regaining access in the year following the resolution, especially in the case of gross and net full access. The size of investor losses also have relatively large effects on the probability of access in the first year after resolution, especially in the case of gross full access, for which the log-odds ratio is -0.44 (meaning that the probability of regaining access in the first year is roughly 44% lower than in the baseline). The IIR and polity2 rating also have strong effects on the duration of exclusion, especially for the cases of gross and full access. The federal funds rate has very strong effects for net and full partial access and almost no effect in the case of net and full gross access.

6 Concluding Remarks

This paper quantifies the time it takes for countries to regain access to international capital markets after a sovereign default. We find that the duration of market exclusion varies significantly depending on how access is defined—gross versus net flows and partial versus full access. Middle-income countries regain market access more quickly than low-income countries, highlighting the importance of pre-existing economic structures in shaping post-default recovery.

Our findings contribute to the academic literature by refining the measurement of market access, particularly through the use of multiple definitions—gross vs. net and partial vs. full access. These distinctions underscore the importance of clearly defining market access in empirical studies of sovereign default recovery. By doing so, our work highlights how different definitions can lead to substantial differences in the measured duration of exclusion. This suggests that future research on sovereign defaults should account for these variations in order to provide more accurate assessments of post-default recovery processes. Additionally, our results can help inform policy design, especially when considering programs aimed at reestablishing market access in the aftermath of sovereign defaults.

While this analysis advances our understanding of sovereign defaults, future research could explore the role of global factors and regional variations more deeply. Additionally, using more granular data could help establish clearer causal links between default events and the duration of market exclusion. Such work would further enhance the design of policies aimed at shortening periods of exclusion and mitigating the economic costs of sovereign defaults.

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A Data Appendix

A.1 Default events data

The list of default events and the dates of when these events started and were resolved come from Asonuma and Trebesch (2016). In Asonuma and Trebesch (2016), the list of events contains separate information about bond and non-bond defaults. However, because for the purpose of our analysis we are not interested in distinguishing between types of defaults, we grouped some of the episodes when there was overlap. The resulting list of events with start of default year and end of resolution year is presented in Table A1.

To identify overlapping default periods, we compare default cases within each country:

- If two default periods overlap, we keep the period with the latest end of default and consider this to be continuous.
- If a default period completely contains another episode, we keep the larger one, as it must have the latest end of default.
- If a default ends (using the exact date instead of the year) when another default begins, we drop the prior one and count this as one continuous default.
- If two defaults begin at the same time, we keep the one with the latest end of default date and consider this to be one default episode.

A.2 Other data

Table A2 lists the other variables and respective sources used in the paper.

[15]To impute income level missing information, we run an ordered logistic regression of a numeric version of historical income level on external debt stock, exports as percent of GDP, total reserves in months of imports, and GNI. Then, we predict the probability of an observation being a certain GDP level, and impute with the highest value.

Table A1: List of default events.

Country	Start default	End default	Country	Start default	End default
Albania	1991	1995	Mauritania	1992	1996
Algeria	1990	1992	Mexico	1982	1983
Algeria	1993	1996	Mexico	1984	1985
Argentina	1985	1987	Mexico	1986	1987
Argentina	1988	1993	Mexico	1987	1988
Argentina	2001	2005	Mexico	1988	1990
Belize	2006	2007	Moldova	2001	2004
Belize	2012	2013	Mongolia	2017	2017
Belize	2016	2017	Morocco	1985	1987
Bolivia	1980	1988	Morocco	1989	1990
Bolivia	1988	1993	Mozambique	1983	1991
Bosnia and Herzegovina	1992	1997	Mozambique	2015	2016
Brazil	1983	1984	Mozambique	2016	2019
Brazil	1986	1988	Nicaragua	1978	1980
Brazil	1989	1994	Nicaragua	1981	1981
Bulgaria	1990	1994	Nicaragua	1982	1982
Cameroon	1985	2003	Nicaragua	1983	1984
Chad	2014	2015	Nicaragua	1985	1995
Chad	2017	2018	Niger	1983	1984
Chile	1983	1984	Niger	1984	1986
Chile	1984	1986	Niger	1986	1991
Chile	1986	1987	Nigeria	1982	1983
Chile	1990	1990	Nigeria	1983	1984
Congo, Dem. Rep. (Zaire)	1975	1980	Nigeria	1987	1988
Congo, Dem. Rep. (Zaire)	1982	1983	Nigeria	1989	1991
Congo, Dem. Rep. (Zaire)	1983	1984	Pakistan	1999	1999
Congo, Dem. Rep. (Zaire)	1984	1985	Panama	1984	1985
Congo, Dem. Rep. (Zaire)	1985	1986	Panama	1987	1996
Congo, Dem. Rep. (Zaire)	1986	1987	Paraguay	1986	1993
Congo, Dem. Rep. (Zaire)	1987	1989	Peru	1976	1978
Congo, Rep.	1983	1988	Peru	1979	1980
Congo, Rep.	1988	2007	Peru	1983	1983
Costa Rica	1981	1983	Peru	1984	1997
Costa Rica	1984	1985	Philippines	1983	1986
Costa Rica	1986	1990	Philippines	1986	1987
Cote d'Ivoire	1983	1998	Philippines	1988	1990
Cote d'Ivoire	2000	2010	Philippines	1990	1992
Cote d'Ivoire	2011	2012	Poland	1988	1989
Dominica	2003	2004	Poland	1989	1994
Dominican Rep.	1982	1986	Russia	1991	1997
Dominican Rep.	1987	1994	Russia	1998	2000
Dominican Rep.	2004	2005	Sao Tome and Principe	1984	1994
Ecuador	1982	1983	Senegal	1981	1984
Ecuador	1984	1985	Senegal	1985	1985
Ecuador	1986	1995	Senegal	1990	1990
Ecuador	1999	2000	Senegal	1992	1996
Ecuador	2008	2009	Serbia and Montenegro	1992	2004
Ethopia	1990	1996	Seychelles	2008	2010
Gabon	1986	1987	Sierra Leone	1980	1995
Gabon	1989	1994	South Africa	1985	1987
Gambia,The	1984	1988	South Africa	1989	1989
Grenada	2004	2005	South Africa	1992	1993
Grenada	2013	2015	Sudan	1975	1985
Guinea	1985	1988	Tanzania	1981	2004
Guinea	1991	1998	Togo	1987	1988
Guyana	1982	1992	Togo	1991	1997
Guyana	1993	1999	Turkey	1976	1979
Honduras	1981	1989	Turkey	1981	1982
Honduras	1990	2001	Uganda	1979	1993
Jamaica	1978	1979	Ukraine	1998	1998
Jamaica	1980	1981	Ukraine	1999	1999
Jamaica	1983	1984	Ukraine	2000	2000
Jamaica	1984	1985	Ukraine	2015	2016
Jamaica	1986	1987	Uruguay	1983	1983
Jamaica	1987	1990	Uruguay	1985	1986
Jordan	1989	1993	Uruguay	1987	1988
Kenya	1992	1998	Uruguay	1989	1991
Liberia	1980	1982	Uruguay	2003	2003
Macedonia, FYR	1992	1997	Venezuela, RB	1983	1986
Madagascar	1981	1981	Venezuela, RB	1986	1987
Madagascar	1982	1984	Venezuela, RB	1989	1990
Madagascar	1987	1990	Vietnam	1982	1997
Malawi	1982	1983	Yemen, Republic of	1983	2001
Malawi	1987	1988	Zambia	1983	1994

Note: List of default events and corresponding starting and ending years used in the analysis. This list is a subset of the list of default events in Asonuma and Trebesch (2016) because it only includes events for which there were capital flows data to calculate the duration of exclusion from capital markets.

Table A2: Data used and sources.

Variable	**Source**
Institutional Investors' Rating (IIR)	Institutional Investor Magazine
Polity2	Political Instability Task Force
Natural disasters information	EM-DAT: The International Disaster Database
IMF program	International Monetary Fund
Federal Funds Rate	St. Louis Fed FRED database
BAA corporate bond yield to 10yr Treasury constant maturity	St. Louis Fed FRED database
Country income level	World Bank and authors' calculations[15]
Capital flows data	International Debt Report, World Bank

B Additional Results

B.1 Duration of market exclusion based on different borrowing thresholds

The main results in the paper are based on borrowing simply being positive (partial access) or being larger than 1% of GDP (full access). While using positive borrowing as a cutoff for having access is fairly natural, the choice of 1% of GDP is somewhat *ad-hoc*. However, as discussed in the main text, the 1% cutoff is just used for the purpose of distinguishing cases in which countries can borrow very little from cases where countries can borrow more substantial amounts. In Table B1 we show results based on two alternative thresholds, 0.5% and 2% of GDP, and compare those results to the cases of partial access (or borrowing above 0% of GDP) and full access (or borrowing above 1% of GDP).

Table B1: Duration of capital market exclusion for different borrowing thresholds.

	Partial Access		Full Access (0.5%)		Full Access (1%)		Full Access (2%)	
	Gross	Net	Gross	Net	Gross	Net	Gross	Net
1^{st} Quartile	1	1	1	2	1	3	1	6
Median	1	2	1	6	3	8	5	12
3^{rd} Quartile	2	6	9	14	15	16	21	
F(1)	.68	.38	.5	.2	.43	.16	.34	.097
Nr. of Events	148	144	148	144	148	144	148	144

Note: Entries in the first 3 rows in the table are the number of years between sovereign default resolution and market access. Row number 4, $F(1)$, is the percentage of countries that regained access to capital markets in the first year after sovereign default resolution. These statistics are an upper bound for the duration of exclusion because the aggregate borrowing data are annual.

As could be expected, the results based on different cutoffs are different, but the main point that the amount of borrowing matters is still clearly visible in the table.

B.2 Duration of market exclusion by date of default for low- and middle-income

Tables B2 and B3, provide statistics on the duration of market exclusion for defaults resolved before and after the year 2000 for low- and middle-income countries, respectively. As can be seen in these two tables, the pattern observed in the aggregate that the duration of exclusion has become shorter is also present for low- and middle-income countries separately.

Table B2: Duration of capital market exclusion by date of the sovereign default resolution - low-income countries.

	Partial Access		Full Access	
	Gross	Net	Gross	Net
Panel A: Before 2000				
1^{st} Quartile	1	1	5	8
Median	1	4	11	15
3^{rd} Quartile	6	8	23	
F(1)	.53	.26	.2	.043
Nr. of Events	49	47	49	47
Panel B: In or After 2000				
1^{st} Quartile	1	1	1	1
Median	1	1	1	2
3^{rd} Quartile		1	7	8
F(1)	.7	.75	.5	.38
Nr. of Events	10	8	10	8

Note: Entries in the first 3 rows in panels A and B in the table are the number of years between sovereign default resolution and market access. Row number 4, $F(1)$, is the percentage of countries that regained access to capital markets in the first year after sovereign default resolution. These statistics are an upper bound for the duration of exclusion because the aggregate borrowing data are annual.

Table B3: Duration of capital market exclusion by date of the sovereign default resolution - middle-income countries.

	Partial Access		Full Access	
	Gross	Net	Gross	Net
Panel A: Before 2000				
1^{st} Quartile	1	1	1	4
Median	1	2	2	7
3^{rd} Quartile	1	5	7	14
F(1)	.77	.4	.49	.17
Nr. of Events	70	70	70	70
Panel B: In or After 2000				
1^{st} Quartile	1	1	1	1
Median	1	2	1	3
3^{rd} Quartile	2	4	2	6
F(1)	.74	.47	.74	.32
Nr. of Events	19	19	19	19

Note: Entries in the first 3 rows in panels A and B in the table are the number of years between sovereign default resolution and market access. Row number 4, $F(1)$, is the percentage of countries that regained access to capital markets in the first year after sovereign default resolution. These statistics are an upper bound for the duration of exclusion because the aggregate borrowing data are annual.