

Crossing the threshold: A positive analysis of IBRD graduation policy

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Abstract According to World Bank policy, countries remain eligible to borrow from the IBRD until they are able to sustain long-term development without further recourse to Bank financing. Graduation from IBRD is not an automatic consequence of reaching a particular income level, but rather is supposed to be based on a determination of whether the country has reached a level of institutional development and capital-market access that enables it to sustain its own development process without recourse to Bank funding. This paper takes a positive approach to IBRD graduation policy, investigating what income and non-income factors appear to have influenced graduation status in recent decades, based on panel data for 1982 through 2009. Explanatory variables include the per-capita income of the country, as well as measures of institutional development and market access that are cited as criteria by the graduation policy, and other plausible explanatory variables that capture the levels of economic development and vulnerability of the country. We find that the observed correlates of Bank graduation status are generally consistent with the stated policy. Countries that are wealthier, more creditworthy,

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more institutionally developed, and are less vulnerable to trade, financial, and other shocks are more likely to be graduates. Predicted probabilities generated by the model conform closely to the actual graduation and de-graduation experiences of Trinidad and Tobago and Korea, among other countries, and suggest that Hungary and Latvia may have graduated prematurely—a prediction subsequently borne out by the large loans that they later received from the IBRD in the wake of the global financial crisis.

Keywords World Bank · IBRD · International financial institutions · Graduation · Borrowing eligibility · Institutional development · Creditworthiness

JEL Codes F34 · F53 · O19 · O43

1 Introduction

This study investigates how income and non-income factors affect graduation from the IBRD (International Bank for Reconstruction and Development). While the Bank does have an income threshold for IBRD borrowing, there is no automatic graduation rule linked to per-capita income of the borrowing country. According to World Bank policy, countries remain eligible to borrow from the IBRD until they are able to sustain long-term development without further recourse to Bank financing and until they have reached a sufficiently advanced level of development. The income threshold (currently \$6885) is simply a trigger for beginning of discussions on graduation, which then look beyond the income proxy to assess whether the country meets the criteria for graduation. In contrast, eligibility for the World Bank's concessional lending through IDA (International Development Association) is more tightly linked to per capita income, and with a few exceptions ends when a country exceeds a certain threshold (currently \$1165).

This paper takes a positive approach to IBRD graduation policy, investigating what income and non-income factors appear to have influenced graduation (and de-graduation) decisions over the past three decades. It does so through logit estimation using panel data from 1982 through 2009 on the graduation status of countries above the IBRD income threshold in those years. Explanatory variables include the per-capita income of the country, as well as measures of institutional development and market access that are cited as criteria by the graduation policy, and other plausible explanatory variables that capture the levels of economic development and vulnerability of the country. We supplement the panel data analysis of graduation status with hazard models of graduation.

This study represents the first empirical analysis of IBRD graduation status and timing. Understanding how and when middle-income countries graduate from borrower status is important in forecasting the number of likely graduates, and in allowing us to anticipate better the likelihood of de-graduation. Although graduates are supposed to be able to finance their own development process, in practice a number of graduates have been driven to return to the IBRD for financing by subsequent economic shocks, most recently in 2009 during the global financial crisis. Does this mean that policy is not being applied correctly? Are countries

graduating prematurely because of a lack of attention to factors like per capita income, institutional development, and creditworthiness?

We find that, as expected, per-capita income is an important predictor of graduation status. Thus even though all the country-years in the sample are above the IBRD threshold, the greater the amount by which a country's income exceeds the threshold, the greater the probability of being a graduate. This probability also increases with the number of years a country has exceeded the income threshold. But in addition, after controlling for income, other factors cited in the graduation policy are significant predictors of graduation status. Specifically, institutional development (as measured by indicators from the International Country Risk Guide and Freedom House) and creditworthiness increase the probability of being a graduate. Beyond these explicit graduation criteria, we identify other significant explanatory variables that are likely picking up other aspects of institutional development and ability to sustain development, including measures of the economy's vulnerability. Hazard models, based on a more limited set of cases, confirm the importance of creditworthiness and political freedoms for graduation decisions.

With a relatively few variables, our logit model for graduation status is able to predict correctly the IBRD graduation status of a country in a high percentage of cases. Predicted probabilities generated by the model conform closely to the actual graduation and de-graduation experiences of Trinidad and Tobago and Korea, among others, and suggest that Hungary and Latvia may have graduated prematurely—a prediction subsequently borne out by large recent loans to those countries intended to mitigate the impact of the global financial crisis.

To supplement the analysis of graduation status, we also analyze the determinants of IBRD borrowing levels. These results are largely consistent with the graduation results: higher incomes are associated with lower levels of borrowing, as are better credit ratings (which likely subsume judgments about institutional development). These results suggest that the path to graduation is evolutionary rather than abrupt: the same factors that gradually reduce a country's demand for IBRD loans also eventually lead it to graduate.

2 Background

“Graduation” refers to the Bank's formal determination that a country has attained a certain level of development that renders it ineligible for new IBRD borrowing. It reflects the achievements of a country in reaching a certain level of development, management capacity, and access to capital markets. The legal cornerstone for graduation is Article III, Section 4 (ii) of the IBRD's Articles of Agreement.¹ It states that the Bank may guarantee or make loans if it is satisfied that, in the prevailing market conditions, a borrower would be otherwise unable to obtain the loan under reasonable conditions. The other provision relevant to graduation is Article 1 (ii), which states that Bank financing supplements private investment when private capital is not available on reasonable terms.

¹ The Articles can be found at <http://go.worldbank.org/WAUZA5KF90>.

The graduation process has evolved over time. A graduation threshold based on a country's per-capita income was first proposed in 1973, by which point 13 member countries had already permanently ceased borrowing from IBRD. The threshold value of gross national income (GNI—referred to as GNP at the time) per capita, was set at \$1,000 measured in 1970 prices. The Executive Directors approved a more comprehensive policy on graduation in 1982, with a clarification issued in 1984 (Shihata 2000). The policy identifies two key factors on which to base the graduation decision:

- A country's level of development and overall economic situation
- A country's capacity to sustain long-term development without further recourse to the Bank's financial resources

Two substantive criteria underlie assessments of these conditions:

- A country's ability to access external capital markets on reasonable terms
- A country's progress in establishing key institutions for economic and social development

GNI per capita is clearly correlated with these hard-to-measure criteria for graduation. The 1982 policy maintained use of the GNI per capita threshold—updated to account for global inflation—as the benchmark for initiating an assessment of graduation by management. According to the 1984 clarification, GNI (GNP) per capita is to be used as an indicator that a country has reached a level of development where it can sustain its development process without Bank lending. However, the 1984 Board statement also clarifies that a country's attainment of the prescribed GNI benchmark does not automatically imply that it must graduate. Rather, it is merely a milestone for Bank management to begin reviewing the country's development, its overall economic situation, and its capacity to sustain a long-term development program. Graduation is to take place only when the country has met the conditions and substantive factors listed above (Shihata 2000).

This paper takes a positive approach to understanding graduation from IBRD—"positive" in the sense of describing actual behavior, as opposed to a normative approach that specifies how the graduation policy *should* operate. Our approach is analogous to the positive analyses of government, which does not assume that government acts as a welfare-maximizing social planner, but instead analyzes how governments actually perform and what appears to motivate their behavior. In this case, the object is to analyze not the official graduation policy of the Bank, but how it has been applied in practice.

The current policy on graduation is highly flexible, in part because it is widely recognized that the income threshold is an imperfect proxy for the two criteria of access to capital markets and adequate institutions. A flexible policy does not necessarily imply an inconsistent or non-transparent policy, however. It should be possible to identify a limited set of indicators of institutional development that—together with per-capita income and creditworthiness—can help distinguish graduates from non-graduates and explain IBRD borrowing levels of non-graduates. The goal is to make (partially) observable these unobservable institutional factors that influence decisions on the continued need for engagement as IBRD borrowers.

3 Sample and Methodological Approach

We present three sets of tests each designed to answer related but different questions, and each calling for a different sample:

- A logit analysis of graduation status
- Hazard models of graduation
- Logit and tobit analyses of borrowing

Appendix 1 lists the 34 countries in the main sample used in the logit analysis of graduation status covering the 1982–2009 period. As noted above, the Bank does not begin to discuss graduation until a country crosses the IBRD income threshold. We therefore limit our sample to only those country-year observations with per capita incomes exceeding the threshold level. The objective of the logit analysis is to test whether the “graduate” observations differ significantly from the “non-graduate” observations on indicators of institutional development, creditworthiness, vulnerability to shocks, and other factors.

Graduation dates are listed where applicable in Appendix 1, along with dates of subsequent de-graduation for some countries. All of the countries in our main sample that have graduated from the Bank did so after 1970. Several of these nations subsequently “de-graduated” or borrowed again.

Appendix 2 lists 21 additional countries that are over the IBRD income threshold (in some or all years) and either graduated by 1972—before a graduation income threshold was first defined in 1973—or never borrowed from the IBRD. (Examples include the US and Saudi Arabia.) None of these countries has de-graduated. They arguably had a very low risk of de-graduating throughout the 1982–2009 period, and their experience may have little relevance to those at higher risk. As long as their risk was non-zero, however, there is some justification for including them in our sample. We therefore test robustness of results based on the main sample to the use of an expanded sample that includes these 21 high-income non-borrowers and early graduates.

Our dataset represents an unbalanced panel of annual observations from 1982–2009. Independent variables in the analysis are lagged by 1 year, so their values cover 1982–2008, with graduation status measured for 1983–2009. We choose 1982 as the starting year in part because one of the key institutional indicators (from the International Country Risk Guide) is unavailable until that year. It is also the year the Board adopted a comprehensive version of the current graduation policy.

The panel is unbalanced for several reasons. First, some countries were not IBRD members until well into the 1982–2009 period. This applies not only to new countries such as those emerging from the former Soviet Union and Yugoslavia, but also to many other countries, including Switzerland. Second, countries generally are not considered for graduation until they meet the income threshold. Sixty-six member countries exceeded the threshold at some point during our sample period, but many of those were not above the threshold in every year in the sample period. Third, several nations are missing data for certain variables in different years scattered throughout the sample time period. We are left with complete data for up to

906 total country-year observations, from 55 nations, in the expanded sample. The main sample includes up to 437 observations from 34 countries.²

Logit analysis of this panel dataset with a 0–1 indicator of graduation status treats graduation and de-graduation symmetrically. For example, an increase of \$1000 in per capita income is assumed to have the same impact on the probability that a non-graduate graduates as a \$1000 decrease has on the probability that a graduate de-graduates. We acknowledge that graduation and de-graduation are unlikely to be fully symmetric in this way. For example, the loss in a government's prestige resulting from a return to borrowing is likely to exceed the prestige benefits of graduating. Also, graduation is more of a gradual process, while de-graduation is often an emergency response to an adverse shock. Despite its limitations in describing the graduation and de-graduation processes, the logit analysis is nevertheless informative in revealing whether or not graduates differ systematically from non-graduates in ways consistent with the policy. As will be shown, predicted probabilities generated by the model explain instances of graduation and de-graduation reasonably well, despite the lack of full symmetry in graduation and de-graduation.

A second set of tests uses hazard models, to analyze more directly the graduation process, specifically its timing. Hazard models estimate the impact of covariates on how long it takes for an event (such as graduation from IBRD) to occur. Observations are country "spells" rather than country-years, where some countries have multiple spells. E.g., Korea's first spell ends in 1995, when it graduated, and a second spell begins in 1998, when it de-graduated and was once again exposed to the "risk" of graduating.

Implementing a hazard model approach requires splitting the sample used in the logit approach. Our graduation hazard model includes all countries-year observations representing countries that are above the income threshold but have not yet graduated at the beginning of the time interval studied. A de-graduation model would include all graduates—whatever their income level—and analyze the determinants of the amount of time until de-graduation. The small number of de-graduation events, however, makes it infeasible to apply hazard models to them: all but six of the subjects would be right-censored.³

We are able to run hazard models of graduation, and they confirm some of the key results on the importance of institutional development and creditworthiness obtained from the logit analyses. Other variables that are significant determinants of graduation status in logit are not significant in hazard models of graduation,

² These sample-size statistics apply to the main specification. For one specification in Table 4, which drops the institutional capacity variable, the sample is slightly larger.

³ Models of de-graduation fail to attain convergence, and some regressors in the logit analysis must be dropped for graduation models to converge. As suggested by a referee, it is possible to analyze graduation and de-graduation together, by an appropriate transformation of the data, by assuming the two processes are symmetric. Three of the six de-graduation events would be right-censored in such an analysis, however, if years in which income is below the IBRD threshold were dropped, for consistency with the graduation sample. In the logit analysis, where the timing of graduation is not at issue, dropping all country-years in which income is below the threshold does not eliminate time-series variation in graduation status, as income for the de-graduates eventually rises above the threshold again. In the hazard analysis, rising above the threshold again would initiate a new spell that in our data is invariably right-censored.

possibly due to the smaller sample of events rather than to any asymmetry in the graduation and de-graduation processes.

Although a hazard model for de-graduation proved infeasible, the proximate cause of de-graduation is apparent for all six instances. All six de-graduations closely followed exogenous shocks that undermined creditworthiness; however, they form two distinct groups. For Gabon (1988), Venezuela (1989) and Trinidad (1990), rapid declines in petroleum prices not only impaired their creditworthiness but drove their per capita incomes back below the IBRD threshold. Korea (1998), Hungary (2009) and Latvia (2009) were hit by severe financial crises originating in other countries that impaired their creditworthiness, but their per capita incomes remained well above the IBRD threshold.⁴ Exogenous shocks are of course not a complete explanation: not all countries exposed to such shocks resort to borrowing from the IBRD. Institutional development among other factors likely plays a role in countries' resilience to shocks.

4 Data and Hypotheses

Graduation reflects a determination that a country has achieved a more advanced level of development, institutional capacity, and access to capital markets. Since income is obviously a proxy for these factors—as reflected in the threshold trigger—wealthier nations should be more likely to be graduates. The IBRD threshold is measured in current-dollar GNI per capita, so we take (the log of) the amount by which each country in the sample exceeds the threshold. We expect that larger gaps between actual income and the threshold will increase the probability a country is a graduate.

Graduation is unlikely to be initiated as soon as a country exceeds the income threshold, since official policy specifies only that the income threshold initiate consideration of graduation. It therefore seems plausible that the longer a country has exceeded the threshold, the greater the probability of being a graduate. The income data do not always go far enough back in time for us to determine the exact number of years a country has exceeded the threshold, and in any case the count would have to start from no earlier than 1973, when a threshold was first defined. Instead, we use a dummy variable coded 1 for country-years for which the threshold has been exceeded for 7 or more consecutive years. Coding this variable accurately only requires income data going back to 1975.

The graduation policy does not give any explicit and detailed definition of what constitutes “progress in developing key institutions of economic and social development.” There are references to “management capacity” and, more narrowly, to “economic management capacity” (Shihata 2000). A reasonably good proxy for

⁴ Among these three countries, only Korea contributes more than one observation to the logit analysis following its de-graduation. The oil-exporting de-graduates also contribute very few observations to the logit analysis following their de-graduation, because the sample includes only country-years in which incomes exceeded the IBRD threshold. Trinidad re-enters the sample in 2001, and Venezuela and Gabon re-enter only in 2007 and 2008. The vast majority of 0 values on the graduation status variable are thus accounted for by countries that have not yet graduated, as opposed to countries that have de-graduated.

this concept is the “quality of the bureaucracy” indicator from International Country Risk Guide (ICRG).⁵

In the last 20 years, institutional accounts of economic development have broadened, as recognized in many World Bank reports (for example, World Bank 2001; World Bank 2006). The *Global Monitoring Report 2006* (World Bank 2006) provides a three-way classification of institutions for development: Bureaucratic Capability, Provision of Public Services (including regulation of firms and resolution of disputes), and National Checks-and-Balances Institutions. The ICRG provides two additional indicators—on adherence to the “rule of law,” and extent of “corruption in government”—that, along with “quality of the bureaucracy,” proxy reasonably well for this broadened view of institutions for development. Countries are rated on a 0–6 scale by ICRG on each of these three indicators, with higher values representing institutions more favorable to development. We take the sum of the three ICRG variables as a composite indicator of *Institutional Capacity*.

Empirical studies provide evidence that countries with higher ratings on these and similar indicators are associated with higher levels of investment and growth (Knack and Keefer 1995; Acemoglu et al. 2001). Part of this statistical association may be due to reverse causation from strong economic performance to more positive assessments of institutional capability (see, for example, Glaeser et al. 2004). This question is not central in the context of graduation decisions, however, as all candidates for graduation have relatively high incomes already. What matters instead is their “capacity to *sustain* a long term development program” [emphasis added] as reflected in part by “the extent of progress in establishing key institutions for economic and social development” (Shihata 2000).

A more cautious approach toward graduation is thus warranted for countries where this sustainability is in question—that is, where the country has a higher likelihood of falling back below the income threshold. Relevant institutional indicators then are those associated with lower volatility in income levels and growth rates (Rodrik 1999; Quinn and Woolley 2001; Mobarak 2005).

Rodrik (1999) emphasizes “institutions of conflict management” that he argues are particularly important following adverse shocks that often trigger distributional conflicts. Institutions of conflict management are those that “adjudicate distributional contests within a framework of rules and accepted procedures,” including “an independent and effective judiciary” and “an honest and non-corrupt bureaucracy.” A stronger rule of law restricts the potential scope of redistribution, reducing the incentive and ability of social groups to make “opportunistic grabs” in countries with latent social conflicts. As empirical proxies, Rodrik uses the ICRG indicators described above, as well as indicators of civil liberties and political freedoms produced by Freedom House, arguing that:

Democratic institutions—political parties, elected representatives, free speech, and the like—can be viewed as the ultimate institutions of conflict management, in

⁵ Similar indicators are available from the Economic Intelligence Unit (EIU) and other sources, but only the ICRG covers a large sample of countries going back to the early and mid-1980s. The World Bank’s Country Policy and Institutional Assessments (CPIA) include several relevant indicators, but beginning only in the late 1990s, and only for countries that have not graduated. They therefore cannot be used for explaining differences between graduates and non-graduates. Moreover, the CPIA ratings are publicly available only for IDA-eligible countries, and only from 2005 onward.

that they allow for differences among social groups to be resolved in a predictable, inclusive, and participatory manner (p. 395).

Quinn and Woolley (2001) provide strong empirical evidence that democracies experience much less volatility in income growth than non-democracies, although average income growth is similar in the two groups.⁶ Their explanation is somewhat different from Rodrik's. They argue that voters are risk-averse, and show that voters reward incumbent governments only modestly for growth, but penalize them severely for volatility. This explanation is consistent with research by Dreze and Sen (1989), attributing India's ability to avoid major famines (during a period when its average economic performance was weak) to its democratic institutions, including a free media. Mobarak (2005) provides additional supporting evidence, showing that democracy reduces volatility rather than the other way around. He argues that if policy makers "unilaterally set policies, the variance of policies and outcomes will generally be higher than if policies are chosen through consensus" by democratic procedures. As noted by Henisz (2004) and others, checks on executive power tend to increase the stability of economic policy.

We therefore use *Political Freedoms* as a second indicator of institutional development. Following Rodrik (1999), Mobarak (2005), and others, we base this indicator on the Freedom House measures of Civil Liberties and Political Rights. The Civil Liberties index captures freedom of expression and beliefs, freedom for association and organization, and protection from the state in political, civil, and criminal matters. The Political Rights index captures free and fair elections, political pluralism, and government accountability. Each ranking is measured on a 1–7 scale. Our chosen proxy for *Political Freedoms* is the sum of the two rankings. We have reversed the original scale to make them more intuitive, so that higher values represent more political openness. (There is some conceptual overlap in *Institutional Capacity* and *Political Freedoms*; for example, both measure aspects of the rule of law. Empirically, the two indexes are correlated at .46.) As will be shown below, results obtained using the Freedom House *Political Freedoms* indicator are robust to using alternative measures of democracy and of constraints on the executive from the Polity data base.

Institutional development as measured by our two indicators may affect graduation (and de-graduation) decisions through other channels, in addition to its implications for income volatility. In countries with greater *Institutional Capacity* and more *Political Freedoms*, growth is likely to be more inclusive, with the benefits of high incomes not confined to elites. Knack (2002) shows that in more institutionally developed countries (as measured by ICRG indicators), growth in incomes is most rapid for the lower-quintile groups in the income distribution in each country. Public resources are also likely to be used more effectively: revenues will be raised and expended in more efficient and equitable ways, producing higher-quality public services (see, e.g., World Bank 2003; Rajkumar and Swaroop 2008). Income inequality and human development are important outcomes in themselves; to

⁶ Many cross-country time-series studies (for example, Burkhart and Lewis-Beck 1994) conclude that the link between democracy and high per capita income is explained mostly by causation from income to democracy. Acemoglu et al. (2008) conclude from their analysis that there is no causal link between income and democracy, but that both are determined jointly by longer-run historical factors.

the extent that higher-quality public services in health and education increase the human capital of workers, the likelihood that per-capita income will fall below the IBRD threshold will also decline.

As a third indicator of institutional development, we include a transition economy dummy variable for the countries of Central and Eastern Europe and the former Soviet Union. For given income levels, their economic and social institutions for sustained market-based development were relatively backward in the early years of transition. Engagement with the IFIs and other donors—particularly in the early transition years—focused on reform of legal, tax, and other systems designed to produce a convergence with other European countries in economic and social institutions. Based on this reasoning, we would expect transition countries to graduate later than others with similar incomes. On the other hand, the desire to be like other European countries—including by joining the EU, OECD, or NATO—could cause them to transition from borrower to donor status before other countries at similar income levels. The net effect of these two potential transition-status influences on the likelihood of being a graduate could be either positive or negative.

Graduation is also supposed to depend on the country's ability to access foreign credit markets. Actual borrowing or bond issuance would not be an ideal measure of access, however, because it depends not only on the country's ability to borrow but also on its need or desire to do so. Instead, we measure the willingness of foreign markets to lend by Institutional Investor's Creditworthiness ratings, based on a survey of economists' and risk analysts' perceptions of a country's creditworthiness. The ratings are on a 100-point scale, with larger values representing greater creditworthiness.⁷ This indicator measures the risk of default on sovereign debt, which should be a good proxy for access "on reasonable terms" to private capital markets. The graduation policy emphasizes the latter criterion, but the Bank's Articles of Agreement require lending decisions to take into account a country's ability to repay the loan.

A possible concern with our use of credit ratings and ICRG scores in the graduation analysis is reverse causality: a country's graduation (or de-graduation) could trigger a change in experts' perceptions of creditworthiness or institutional quality. Because countries in our sample are all middle- or upper-income, and most if not all are well integrated into global markets, it seems unlikely that IBRD graduation or even de-graduation would provide much new information on the level of institutional development and creditworthiness. But to reduce further the possibility that estimates reflect any reverse causation, we lag independent variables in the analysis by 1 year. When we compare results from lagged and contemporaneous scores on creditworthiness and *Institutional Capacity*, coefficients on the lagged variables are larger and more statistically significant, which may allay concerns about reverse causality.

Finally, we consider the role of vulnerability to shocks that may reduce per-capita incomes. For a given level of measured income and institutional quality, countries that are more exposed to shocks seem less likely to meet the criteria for graduation.

⁷ Ratings are provided twice a year, in March and September. We took the average of these. We did not use sovereign bond ratings from rating agencies like Fitch and Moody's because of the incompleteness of their coverage. Early in our sample period, in particular, many countries were not rated.

If they were to graduate, they might be more likely to return to the Bank for assistance because of a realized shock, and so they may be less willing to graduate in the first place. We include two measures of vulnerability to shocks in our analysis. One is the degree of export concentration: countries with exports concentrated in fewer products are likely to face greater volatility and to be more vulnerable to idiosyncratic exogenous shocks. Concentration is measured using a Herfindahl index of export lines, scaled from 0 to 100.

A second measure of vulnerability is country size. The Bank's IDA classifies countries with under 1.5 million people as "small states" that are more vulnerable to natural disasters and macroeconomic shocks. Even middle- or high-income small states may suffer from such vulnerability.⁸ We therefore include an indicator variable for these small countries, with population data taken from the WB-WDI.

In addition, we include one measure of actual shocks: a dummy variable representing whether the country has suffered a systemic banking crisis within the previous 5 years. Data for that variable are drawn from Laeven and Valencia (2008).⁹

All regressions control for a linear time trend. This time trend could reflect the net effect of various factors, such as any tendency to interpret the graduation policy more or less stringently over time. For example, if the IBRD was more capital-constrained early in our sample period, it may have rationed lending and graduated the wealthier above-threshold countries sooner; this would show up in our regressions as a negative time trend.

A final variable in the base specification measures the IBRD income threshold as a share of world average income. The threshold is adjusted to account for inflation (i.e., reduction in the purchasing power of the US dollar), and so it increases over time. It is not adjusted, however, for changes in real income. Most countries have experienced growth in real incomes, not merely in nominal incomes, over the 1982–2009 period. As a share of mean income worldwide, therefore, the IBRD threshold has fallen in most years, and over the period as a whole.¹⁰ Whether this relative threshold value matters for graduation status or not will depend on whether decisionmakers take into account a country's relative income level, rather than just its absolute (real) income level. If they do, then an above-threshold country may be less likely to graduate in years when the threshold that it has exceeded is low relative to world average income.

Descriptive statistics for all variables in both samples are presented in Table 1. The "graduate" variable shows that in 65% of the (country-year) observations in which the country exceeds the IBRD threshold, the country was a graduate. For the expanded sample, this figure rises to 83%. In the main sample, borrowing commitments occur in 19% of the country-year observations, compared to only

⁸ The minutes of the January 26, 1982, discussion of the graduation policy by the Bank's Executive Directors reflect agreement that particular country circumstances, such as "the problems of small countries with narrowly-based economies," should influence how soon a country graduates once it surpasses the income threshold (Shihata 2000).

⁹ The same source provides similar data on debt crises and currency crises, but those turned out to be unrelated to graduation. For simplicity, we report only the results for banking crises.

¹⁰ It is correlated with the linear time trend at -0.78 .

Table 1 Descriptive statistics

	Main sample (N=437)				Expanded sample* (N=906)			
	Mean	Min	Max	StdDev	Mean	Min	Max	StdDev
Graduate dummy	0.65	0	1	0.48	0.83	0	1	0.38
Borrower dummy	0.19	0	1	0.39	0.09	0	1	0.29
IBRD borrowing per capita	5.69	0	117.70	16.49	2.45	0	117.70	11.17
GNI p.c. over threshold	8477	45	51870	8564	14331	45	80615	12119
Over threshold 7+ years	0.75	0	1	0.43	0.88	0	1	0.32
Political freedoms	11.7	3	14	3.1	12.3	2	14	3.1
Institutional capacity	12.8	3.9	18	3.00	14.3	3.9	18	3.24
Transition dummy	0.16	0	1	.37	0.08	0	1	0.27
Credit rating	63.3	23.6	95.30	14.7	73.3	23.6	97.30	16.20
Small country dummy	0.23	0	1	0.42	0.14	0	1	0.35
Bank crisis dummy (first 5 years)	0.06	0	1	0.25	0.06	0	1	0.23
Herfindahl exports concentration	0.08	0.006	0.79	0.12	0.07	0.002	1	0.14
Threshold as share of world mean	0.94	0.725	1.2	0.14	0.95	0.725	1.2	0.13
Year	1997.5	1982	2008	7.9	1996.6	1982	2008	7.8

*Includes all country-years over IBRD income threshold; main sample excludes countries that graduated before 1973 (e.g., New Zealand), as well as high-income countries that never borrowed (e.g., USA, Saudi Arabia)

9% in the expanded sample. Average scores on *Political Freedoms*, *Institutional Capacity* and *Credit Rating* are lower in the main sample.

5 Empirical Results

5.1 Factors Predicting Graduation Status

Table 2 presents logit estimates using a dummy variable coded 1 for years in which the country was an IBRD graduate, and 0 otherwise. The first column of results is for the main sample, while the second column reports results for an identical model specification for the expanded sample. Odds ratios are reported in place of logit regression coefficients, which are not directly interpretable as marginal effects. Standard errors (in Table 2 and in all subsequent tables) are adjusted for non-independence within country “clusters” of observations.

Table 2 Logit estimates for graduate (1=graduate, 0=non-graduate)

Equation	1	2	3	4	5
Variation	Main sample	Expanded sample	Contemp. income	RE logit	FE logit
Log GNI per capita over threshold	1.969* (1.77)	2.528*** (2.75)	2.167** (2.04)	9.969*** (2.83)	7.181* (1.73)
Over threshold 7+ years dummy	9.243*** (2.61)	10.315** (2.36)	9.359* (1.66)	16.618** (2.36)	3.477 (0.95)
Political freedoms	1.419*** (3.33)	1.370*** (3.12)	1.431*** (3.15)	2.798** (2.30)	11.652** (2.26)
Institutional capacity	1.421** (2.38)	1.339** (2.31)	1.423** (2.35)	3.949*** (3.62)	5.156*** (2.64)
Credit rating	1.050** (2.02)	1.075*** (3.24)	1.046 (1.59)	1.150* (1.65)	1.186 (1.32)
Bank crisis in last 5 years	0.037*** (-4.48)	0.064*** (-4.80)	0.036*** (-3.98)	0.336 (0.48)	2.311 (0.27)
Small nation dummy	0.162* (-1.67)	0.127* (-1.86)	-1.408** (-2.57)	0.115 (-1.02)	0.001 (-0.01)
Export concentration	1.106*** (4.06)	1.115*** (4.20)	1.107*** (3.49)	1.249*** (3.32)	1.124 (1.36)
Transition economy dummy	2.066 (0.44)	2.2602 (0.43)	4.411 (0.64)	0.978 (-0.01)	
Time trend	0.771*** (-4.94)	0.746*** (-5.11)	0.763*** (-5.03)	0.529*** (-3.98)	0.642** (-2.23)
Threshold as share of world mean income	0.017 (-1.24)	0.021 (-1.24)	0.015 (-1.11)	0.001 (-2.14)	0.001 (-1.05)
Number of observations	437	906	416	437	169
Number of nations	34	55	34	34	14
Adj. pseudo-R ²	0.59	0.68	0.57	0.76	0.53
Correctly predicted	89.7%	94.6%	89.9%	-	-

t-statistics (in parentheses, beneath odds ratios) are cluster-adjusted; *indicates significance at the .10 level, **at the .05 level, and ***at the .01 level for two-tailed tests

Wealthier countries are significantly more likely to be graduates, as expected. Specifically, even with this sample, which is limited to country-year observations that exceed the IBRD income threshold, a country is more likely to be a graduate when its income exceeds the threshold by a lot rather than by a little. The odds ratio of 1.97 indicates that a 1-unit increase in the log of income over the threshold (e.g., from \$4,800 over to \$13,000 over) nearly doubles the chance of being a graduate. This variable is significant only at the .10 level in the main sample, but at the .01 level in the expanded sample, where the odds ratio is also somewhat larger.

Countries over the threshold for seven or more years are about 9 or 10 times as likely to be graduates as other countries. This variable is significant at the .01 level in the main sample, and at .05 in the expanded sample.

The indicators for institutional development are both statistically significant and have the expected signs, in both samples. That is, higher institutional capacity and greater political freedoms both contribute positively to the likelihood of being a graduate. A 1-unit increase in *Political Freedoms* or *Institutional Capacity* is associated with an increase of about 40% in the odds of being an IBRD graduate. In terms of predicted probabilities, each 1-unit increase in either index is associated with an increase of nearly 3 percentage points in the likelihood of being a graduate.¹¹ These results suggest that despite their conceptual overlap, these indicators each independently measure some aspects of institutional development that matter to decision makers.¹²

Creditworthiness, as proxied by the Institutional Investor's Credit Rating, also has a positive and significant impact on the likelihood of being a graduate. An increase of 20 points (on the 0–100 scale) doubles the odds, and increases the probability of being a graduate by about 8 percentage points.

Transition status does not have any net effect on predicted probability of being a graduate, probably because of two offsetting influences. Of the 11 transition economies over the IBRD threshold by 2008, only seven had graduated. All seven of these entered the EU in 2004, and graduated from IBRD borrowing soon after (between 2004 and 2008). Two of these seven new graduates, Latvia and Hungary, quickly returned to the IBRD as borrowers in 2009, in response to the global financial crisis. These events are consistent with the hypothesis that the transition economies were slow to graduate because they needed assistance from the IFIs in building institutions for markets: only EU members graduated (not Russia or Croatia), and only after entering the EU. However, these events are also consistent with the hypothesis that some of these countries may have graduated too quickly, with EU accession interpreted prematurely as a signal that their transitions were complete.

Shocks represented by recent banking crises (specifically, a crisis occurring in the last 5 years) are associated with a significantly lower likelihood of being a graduate. Odds ratios below one indicate a decrease in the odds, so the odds ratio of about .04 for the banking-crisis variables indicates that, other things equal, the odds of being a graduate drop by 96% for a country with a recent banking crisis.¹³ In terms of probabilities, a banking crisis reduces the likelihood of being a graduate by about 26 percentage points. Similar variables were tested for debt crises and currency crises, but they were not significant and are not included in the tests reported in Table 2.

Smaller countries (those with under 1.5 million population) are less likely than other nations to be graduates, as hypothesized, and the average marginal effect on the probability of being a graduate is about 15 percentage points. The effect is significant only at the .10 level, however. One possible reason for caution in graduating small economies is that they tend to be less creditworthy, so the creditworthiness indicator may be capturing some of the effects of smallness on the probability of being a

¹¹ These are average marginal effects over the sample, rather than for a theoretical observation with all other regressors set at their mean. The latter method produces larger estimates.

¹² When we test each component of *Institutional Capacity* separately, corruption turns out to be the strongest predictor of graduation, followed by rule of law, and then bureaucratic quality. Of the two *Political Freedoms* components, results for civil liberties are somewhat stronger than for political rights. These results are available on request from the authors.

¹³ The average odds of being a graduate for observations in the main sample are about 2 to 1, and a reduction in odds of 95% from that level would imply odds of about .1 to 1, or 1 in 10.

graduate. If creditworthiness is dropped (with the sample unchanged), the t-statistic for the small economy dummy increases (in absolute value) from -1.67 to -2.05 .

Export concentration is positively and significantly related to graduate status, contrary to our hypothesis. Each 1-point increase on the 0–100 index increases the odds of being a graduate by about 11%. This result is counterintuitive, as lack of diversity in export composition makes a country more vulnerable to terms-of-trade or (depending on the commodity) climate-related shocks. A possible explanation for the result is that oil exporters are among the countries with highest concentration, and sentiment for lending to countries receiving large windfall revenues from natural resources may be relatively weak.¹⁴

We tested several other proxies for vulnerability to shocks, including terms-of-trade shifts, exports as a share of GDP, and agricultural value added as a share of GDP. These were not significant predictors of graduation status, and are not reported in the tables for space reasons.

The time trend is negative and significant, meaning that a country with a given set of values for income, credit rating, and other variables was less likely to be a graduate in the 2000s than in the 1980s. With each passing year, the odds of being a graduate decline by about 23%, and the probability declines by about 2 percentage points. This negative trend likely reflects some combination of two factors. First, IBRD lending volumes appear to have been more supply-constrained earlier in the 1982–2009 period, and more demand-constrained in later years. Second, there was an increased awareness later in the period of the importance of non-lending assistance in development, which likely gave even countries that did not need financial resources more reason to stay engaged with the Bank.

The time trend may also capture the steady decline in the value of the IBRD income threshold relative to average world income, a trend noted above. It is plausible that countries are more reluctant to graduate at the threshold—or that the Bank is more reluctant to graduate them—given that the threshold no longer signals the level of relative success that it once did. Yet although we control for changes from year to year in the ratio of the IBRD threshold to average world income, the time trend nevertheless remains significant and negative. The coefficient estimate for the threshold-world income ratio itself is negative but not significant.

Results for the main sample (equation 1) and expanded sample (equation 2) are very similar, despite the large increase in number of observations and countries in moving from the former to the latter. This is consistent with the assumption that the same factors that determine graduation status of middle income countries are also relevant for high income countries.

5.2 Predicted vs. Actual Graduation

One way to assess the value of this positive approach to uncovering the determinants of graduation status is to compare predicted graduation patterns with actual graduation decisions. With the relatively few variables in Table 2, our model is

¹⁴ In 1975, the Bank decided to provide IBRD loans “only on an offset basis to oil producing countries in capital surplus.” It is unclear how long this policy lasted. Oil exporters were excluded from access to exceptional resources under the pilot Crisis Response Window in IDA15 (World Bank 2010).

able to predict correctly the IBRD graduation status of a country in a high percentage of cases. If instead of using the model, we were to rely solely on the IBRD income threshold in predicting whether or not an observation in the main sample was a graduate, our prediction would be correct 65% of the time—because in 65% of observations, countries over the threshold were in fact graduates. (The share rises to 83% if we include all high-income countries as well, in the expanded sample.) But once we incorporate the specific level of income, institutional, and other factors included in the model, we correctly predict 89.7% of the observations (or 94.6% in the expanded sample).

Korea and Trinidad and Tobago (see Fig. 1) illustrate the predictive power of the model. Korea's predicted probability of being a graduate rose rapidly from 1989–1996, peaking in 1996 soon after its actual graduation in 1995. It took out no new IBRD loans in either 1996 or 1997. With the onset of the crisis in 1997, its predicted probability of being a graduate fell rapidly, and in fact it “de-graduated” and borrowed heavily in 1998 and 1999. Korea has not borrowed since 1999, and since 2005 its predicted probability has exceeded 80%. In 2010 it officially joined the OECD-DAC group of aid donors.

Trinidad and Tobago graduated in 1984, when its predicted probability of graduating was well over .5 but declining. Crude oil prices were already well below their 1981 peak, and plummeted below \$10 per barrel in mid-1986. Per-capita income fell each year from 1982 through 1989, as oil prices fell and remained low until 1990. Largely due to declining incomes, Trinidad and Tobago's predicted probability of being an IBRD graduate fell to .10 by 1987. Beginning in 1988 (and continuing through 2000), the country's per-capita income had fallen below the IBRD threshold, so its predicted probability in our framework had effectively fallen to 0. Consistent with the model's prediction, Trinidad and Tobago began borrowing again from the IBRD in 1990, after taking out no new loans in the entire decade of the 1980s.

Even some of the (relatively few) incorrectly predicted observations are quite instructive. Hungary and Latvia graduated in 2007, at a time when their predicted probabilities of graduation were both below 50%: 39% for Hungary and only 10% for Latvia. Yet both countries had to return to the IBRD for financing after the (admittedly major) financial crisis hit in 2008, raising the possibility that they indeed graduated too early. By contrast, when Slovenia graduated in 2004 and the Czech Republic the next year, their predicted probabilities were both above 50%, at 88% and 86% respectively. Neither of those countries was driven to take Bank loans in the wake of the crisis.

These country charts also suggest that the assumption of symmetry between graduation and de-graduation implicit in our empirical approach is not entirely implausible. Predicted probabilities of being a graduate generated by the model decline around the time of de-graduation for Hungary, Latvia, Korea, and Trinidad and Tobago, and the decline is very sharp in the latter two cases. The explanatory variables in the model appear to be important predictors of de-graduation as well as graduation.

5.3 Alternative Per-Capita Income Measures

Equation 3 of Table 2 repeats the analysis from Equation 1, but with one change. In Equation 1, income is measured *ex post*, meaning that the income estimates for each year reflect the best available information as of 2010. In many cases these *ex post*

Predicted graduation probability vs. actual graduation, selected countries

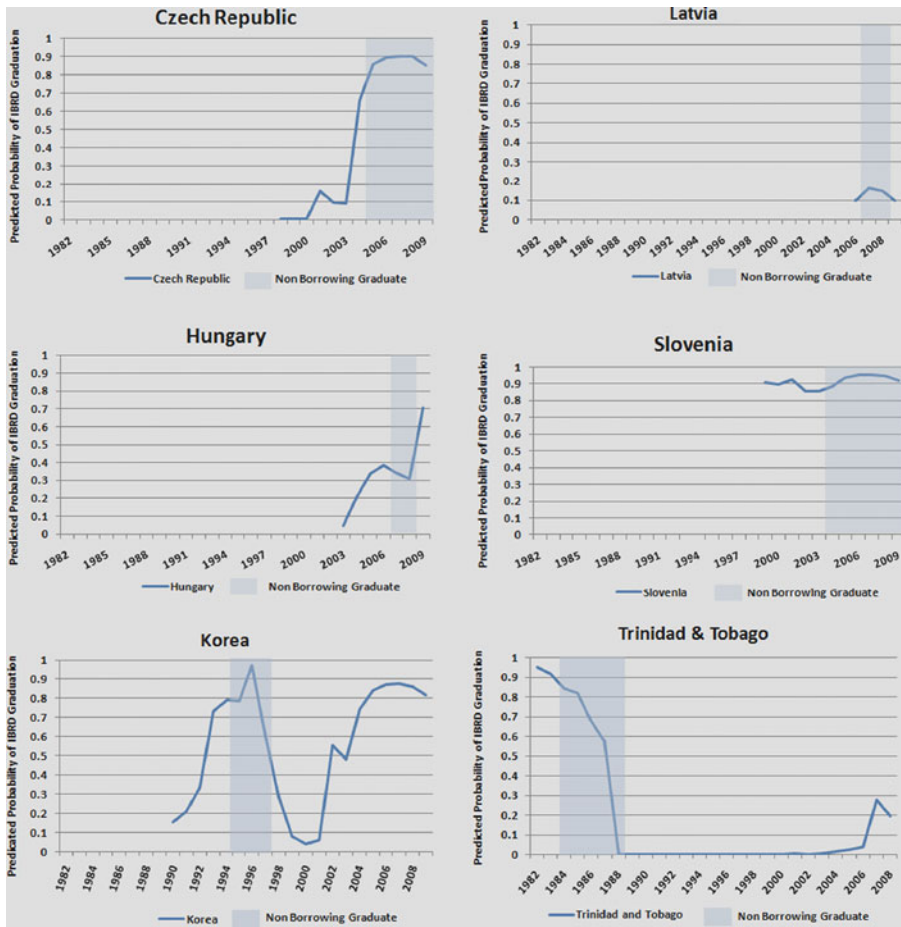


Fig. 1 Predicted graduation probability vs. actual graduation, selected countries

estimates represent a substantial revision from contemporaneous estimates. If graduation decisions at the time were consciously based on the degree to which income was estimated to exceed the threshold, contemporaneous income data—the numbers available to policy makers and Bank officials at the time—may better explain statistically which countries graduate and when. On the other hand, ex post estimates, which incorporate revisions based on information available only later, are presumably more accurate and thus better reflect whether or not a country was really ready to graduate (or in need of de-graduating) at any given time. Bank and government officials may have been operating on that reality as well as on the then-available official numbers. Therefore, it is unclear which set of figures—contemporaneous or *ex post*—might better predict actual graduation status.

Contemporaneous and ex post estimates are correlated at .96, but for a few countries the gap is quite large. Slovakia’s *ex post* estimates for 1993–2006 are much higher than contemporaneous estimates, with a gap of \$730 in 1993 growing to

\$2780 by 2006. For the years 2000–2003, Slovakia’s income was under the IBRD threshold (by about \$1200 on average) based on contemporaneous data, but over the threshold (by about \$700 on average) based on *ex post* estimates.

In equation 3, the sample of countries over the threshold is determined using contemporaneous income estimates. The sample is slightly smaller than in the equation 1 test using *ex post* estimates: revisions are in most cases upward rather than downward, so more countries were (believed to be) under the threshold based on contemporaneous data. Despite this difference in samples, results are nearly indistinguishable from those obtained using *ex post* estimates. Income coefficients and their associated test statistics, as well as measures of goodness-of-fit (including percentage of correctly-predicted cases), are very similar. Significance improves from .10 to .05 for one of the income variables (log of the amount by which per capita income exceeds the threshold), but for the other one (dummy for being over the threshold 7-plus years) it worsens from .01 to .10. These results are consistent with an interpretation that both sets of estimates matter—the ones available to Bank and government officials at the time they were making decisions, and the ones that better reflect the country’s true income levels and thus readiness to graduate, other things equal. We use *ex post* income in all subsequent tests reported in tables, but no important results change if contemporaneous income is used instead.

We also tested (the log of) per-capita income adjusted for purchasing power parity. If PPP-adjusted income is a better measure of living standards than income based on exchange rates, it may provide additional explanatory power in our graduation tests. It is in fact positively and significantly related to the probability of being a graduate, when substituted for our usual income indicator based on exchange rates. When both alternatives are included together, their effects are both positive, but neither variable is significant at conventional levels.

The effects of income on graduation status are therefore robust to measuring income in different plausible ways. However, we do not find evidence that any one of them is the “best” income measure (that is, the most reliable predictor of graduation status).

5.4 Random and Fixed Effects

Equations 4 and 5 of Table 2 report, respectively, random-effects and fixed-effects logit models. Fixed-effects logit estimates are based only on the 14 countries (accounting for 169 observations) for which the dependent variable varies over time—countries that either graduated or de-graduated during our sample period.¹⁵ In these random- and fixed-effects tests, *Political Freedoms* and *Institutional Capacity* remain significant, with higher odds ratios than in equation 1. Creditworthiness and export concentration are significant in random effects but not in fixed effects. The two income variables are significant in random effects, but only one of them is significant—

¹⁵ The 14 countries are Gabon, Venezuela, Cyprus, Czech Republic, Estonia, Lithuania, Oman, Portugal, Slovak Republic, Slovenia, Hungary, Korea, Latvia, and Trinidad. The first two in this list de-graduated; the last four graduated and then de-graduated; and the remainder graduated. Three other countries are excluded because of missing data: Barbados graduated in 1984 but is missing data on *Institutional Capacity*; Bahamas graduated in 1989 but is missing data on *Credit Rating* until 2000; and Iraq de-graduated in 2003 but is missing data on income.

and only at the .10 level—in fixed effects.¹⁶ The time trend remains significant in both tests, with each passing year reducing the odds of being a graduate by more than 35%. The small nation dummy exhibits very little variation over time in the 14-country fixed-effects sample: its coefficient estimate in equation 5 (iii) is based entirely on Oman, which had a population under 1.5 million in its first year (1984) in the sample but over 1.5 million thereafter. The transition dummy drops out of equation 5 entirely, as it does not vary at all over time.

5.5 Alternative Institutional Indicators

As noted above, it is difficult to know how to operationalize the phrase “key institutions for economic and social development.” In Table 3 we therefore test alternative institutional development indicators.¹⁷ Equation 1 includes the democracy index from the Polity dataset, commonly used in political science research. In contrast to the Freedom House indicator, the Polity index does not measure *outcomes* (such as individual rights) often associated with democracy, but focuses instead on democratic *processes*, particularly the methods used in selecting chief executives.¹⁸ Despite this difference, the two variables are correlated at .91, and results for the Polity index in equation 1 are very similar to results for *Political Freedoms* in Table 3. A 1-unit increase in the 0–10 Polity democracy index increases the odds of being a graduate by 36%.

Equation 2 of Table 3 includes a different Polity variable, an index of executive constraints. This index is very highly correlated (at .95) with the democracy index from the same source, so it is not surprising that it produces similar results. A 1-unit increase (on a 1–7 scale) is associated with an increase of 85% in the odds of being a graduate. Results on *Institutional Capacity* and other variables are affected very little by these substitutions of Polity indicators for Freedom House in equations 1 and 2.

It could be argued that “institutions” should be limited to a narrower set most directly relevant for economic development, and that political institutions may influence graduation decisions only indirectly, if at all.¹⁹ Accordingly, in equation 3 we exclude the Polity indicators as well as *Political Freedoms*. Most results from Table 2 still hold. The significance of *Institutional Capacity* strengthens from the .05 to the .01 level, and its odds ratio increases somewhat, presumably because of the substantial correlation between *Institutional Capacity* and the democracy indicators.

Equation 4 of Table 3 includes *Political Freedoms* but drops *Institutional Capacity*. This change allows us to add 45 observations, mostly from small countries

¹⁶ A Hausman test fails to reject the random effects specification in favor of the fixed effects estimation, so the former is preferred on efficiency grounds.

¹⁷ Regressions in this table are all based on the main sample and use the *ex post* measure of per capita income. However, we obtain similar results for the institutional variables if we use the expanded sample or contemporaneous income data.

¹⁸ Our main regressions, in Table 3, use the Freedom House indicator rather than Polity to preserve sample size. Polity does not cover some small countries covered by Freedom House.

¹⁹ According to the World Bank’s Articles of Agreement (Article IV, section 10): “The Bank and its officers shall not interfere in the political affairs of any member; nor shall they be influenced in their decisions by the political character of the member or members concerned. Only economic considerations shall be relevant to their decisions...” Of course, political considerations may influence a member government’s own decisions with respect to graduating from the IBRD.

Table 3 Logit estimates for graduate with alternative institutional indicators (1=graduate, 0=non-graduate)

Equation	1	2	3	4	5
Log of GNI per capita in excess of threshold	1.971* (1.83)	1.969* (1.88)	2.104** (2.25)	1.942* (1.84)	2.000 (1.44)
Over threshold 7+ years dummy	8.790*** (2.59)	9.289*** (2.64)	6.065*** (2.59)	12.009* (3.31)	4.939** (1.96)
Political freedoms				1.428*** (3.65)	
Democracy index (Polity)	1.359*** (2.92)				
Executive constraints (Polity)		1.847*** (3.12)			
Institutional capacity	1.423** (2.31)	1.398** (2.15)	1.479*** (2.75)		
Tax revenue/GDP					1.135** (2.08)
Credit Rating	1.061** (2.44)	1.069*** (2.56)	1.040 (1.52)	1.085*** (3.30)	1.164*** (3.94)
Bank crisis in last 5 years	0.051** (-4.29)	0.044*** (-4.50)	0.041*** (-4.35)	0.042*** (-4.13)	0.068*** (-2.69)
Small nation dummy	0.178 (-1.60)	0.194 (-1.51)	0.152 (-1.55)	0.162* (-1.92)	0.454 (-0.61)
Export concentration	1.108*** (3.51)	1.116*** (3.73)	1.043 (1.34)	1.072*** (3.15)	1.082** (2.31)
Transition economy dummy	2.625 (0.60)	2.692 (0.61)	2.055 (0.51)	1.017 (0.01)	2.794 (0.58)
Time trend	0.753*** (-5.20)	0.740*** (-5.69)	0.809*** (-3.51)	0.822*** (-2.91)	0.768*** (-3.65)
Threshold as share of world mean income	0.007 (-1.46)	0.008 (-1.43)	0.027 (-1.17)	0.559 (-0.18)	0.238 (-0.35)
Number of observations	408	408	437	482	271
Number of nations	32	32	34	36	30
Adj. pseudo-R ²	0.57	0.58	0.54	0.54	0.56
Correctly predicted	89.2%	89.7%	88.3%	86.7%	86.4%

t-statistics (in parentheses, beneath odds ratios) are cluster-adjusted; *indicates significance at the .10 level, **at the .05 level, and ***at the .01 level for two-tailed tests

not covered by the ICRG. Significance strengthens for the small economy dummy, and for creditworthiness.

Equation 5 drops both subjective, expert assessments of institutional development—*Institutional Capacity* and *Political Freedoms*—and instead includes tax revenue as a share of GDP. This measure is often called “tax effort” and interpreted as an indicator of administrative capacity (see, for example, Brautigam et al. 2008). Greater tax effort

may encourage graduation through a second channel, separate from this “institutional” interpretation: governments with access to higher tax revenues have a greater potential to reduce poverty through progressive expenditure and transfer programs.²⁰ We do not include tax effort in most of our regressions because it is available in a comparable series only beginning in 1990, and its inclusion cuts the sample size by nearly half. Despite the relatively small sample, tax effort is significant at the .05 level in regression 5. Each 1 percentage point increase in tax revenue as a share of GDP increases the odds of being a graduate by 13.5%.²¹

5.6 Human Development Indicators

The graduation policy does not define institutional development explicitly. It is conceivable that the quality of “economic and social institutions” is inferred from human development or other outcomes.²² In Table 4 we test for this possibility.

In each of the five regressions reported in Table 4, an additional variable is added to the model from the first equation of Table 2. The added regressor in each test is indicated in bold in the respective column headings, with the coefficient and *t*-statistic for the added regressor shown in bold in a row towards the bottom of Table 4.

Equation 1 adds a measure of educational attainment—average years of completed education for the population age 25 and over—from Barro and Lee (2010).²³ Equation 2 adds instead a health outcome indicator, infant mortality, that has reasonably good data coverage.²⁴ Neither of these human development outcome proxies for economic and social institutions turns out to be significantly related to the probability of being a graduate. Equation 3 adds instead a gender equality indicator, the female labor force participation rate. This variable is also not significant.

Equation 4 adds income inequality, as measured by the Gini coefficient.²⁵ For a given level of average income (which the regression controls for), a higher Gini will tend to be associated with higher poverty rates. Higher poverty in turn may be

²⁰ Ravallion (2009) constructs an indicator of countries’ capacity to eliminate extreme poverty through income redistribution, measured in terms of the marginal income tax rates on the non-poor that would be required. This indicator is available for only a very few countries with incomes exceeding the IBRD threshold, so we are unable to use it in our tests.

²¹ Tax effort varies from 1.3% to 56.7% in the sample, with a mean of 18.6%. It is correlated with *Political Freedoms* at .55 and with *Institutional Capacity* at .40, and is not significant if either or both of those institutional development indicators are included in the regression.

²² An unpublished 1982 memorandum to the Executive Directors describes as an example of institutional weakness “countries that have recently experienced rapid increases in real income because of improved terms of trade or new mineral discoveries” but with “social indicators such as health and education levels [that] are often much lower than in other countries at the same income level.” The same memorandum implies that a failure to address development disparities between groups or regions within a country reflects institutional weaknesses.

²³ Data retrieved from the World Bank EdStats database. Barro and Lee provide estimates only for every fifth year between 1970 and 2010, so we linearly interpolate for the years in between. Results are very similar to those reported here if we treat the in-between years as missing data.

²⁴ Data are from the World Bank’s World Development Indicators (WDI).

²⁵ Data are from the World Bank’s World Development Indicators (WDI). Other measures of income equality (e.g., income share going to the middle quintile) or inequality (e.g., share going to the top decile or quintile) produced similar results.

associated with a greater need for continued access to IBRD loans. However, the regression coefficient for the Gini measure, while positive, is insignificant in Table 4.²⁶

5.7 Additional Hypotheses

Middle-income countries enjoyed increasing access to funds from private capital markets over the 1982–2009 period (Ceballos et al. 2010), so their creditworthiness—measured by the perceived likelihood that their sovereign debt obligations will be honored—may have become more relevant to graduation decisions later in the period. Equation 5 in Table 4 tests this hypothesis, by adding an interaction term, equal to the product of *Credit Rating* and the time trend. The positive and significant coefficient on the interaction term is consistent with this hypothesis.²⁷ A 1-point increase in Credit Rating increases the odds of being a graduate by 5% on average over the sample period, while the interaction coefficient implies that the credit-rating effect was smaller than 5% before 1997, but grew to 11% by 2008.

We also considered the possible relevance of political economy explanations for World Bank decision making. Specifically, we tested for the impact of temporary UN Security Council membership on graduation status. Dreher et al. (2009) find that temporary members of the UNSC receive more World Bank projects, although loan size is unaffected. One interpretation of this finding is that large donor countries represented on the Bank's Executive Board may sometimes approve loans in exchange for favorable votes in the UNSC. However, we believe this argument has little relevance to graduation status. Although the Executive Directors have the authority to graduate a country involuntarily (Shihata 2000), graduation and de-graduation decisions have been largely consensual in practice. And indeed, a dummy for temporary UNSC membership falls far short of significance when added to our graduation regressions.²⁸

5.8 Hazard Models

In Table 5 we report results for hazard models of graduation, where we have 12 (or more) countries that are not right-censored (that is, that graduate during the period

²⁶ Inequality changes slowly over time in most countries, so results in Table 4 are based on the country average values for Gini, from all available data over the 1982–2008 period. If we instead use the annual values and drop all years with missing data, the available sample is far smaller, and Gini is again not significant. Similarly, poverty headcount measures are available only for a very small number of annual observations, and we do not take period averages for poverty headcount because it often exhibits strong variability over time within countries.

²⁷ Calculating coefficient estimates and standard errors for *Credit Rating* conditional on different years (i.e., the time trend variable), we find negative but insignificant point estimates for 1982 through 1989. Point estimates are positive thereafter, attaining significance at the .10 level by 1996 and at the .05 level by 1998. Results for *Credit Rating* shown in the table are conditional on the average value (1997) of the time trend variable.

²⁸ Results available on request. Similarly, voting compatibility with the interest of major donors in the UN General Assembly does not help explain graduation decisions. Kilby (2011) presents evidence that the geopolitical interests of large donor countries, as proxied by General Assembly voting patterns, affect aid allocations of the Asian Development Bank. Barro and Lee (2005) find a similar result for IMF loans.

Table 4 Logit estimates for graduate with added regressors (1=graduate, 0=non-graduate)

Equation	1	2	3	4	5
Added regressor	Mean years education	Infant mortality	Female labor force participation	Gini income inequality	Credit rating x time
Log of GNI per capita in excess of threshold	4.332*** (3.89)	2.776* (1.77)	1.891* (1.71)	12.134** (3.73)	1.904 (1.55)
Over threshold 7+ years dummy	3.417* (1.88)	1.562 (0.49)	9.750*** (2.63)	2.362 (1.15)	7.152** (2.30)
Political freedoms	1.702*** (4.00)	1.423*** (2.78)	1.372*** (3.24)	1.559** (2.11)	1.391*** (3.23)
Institutional capacity	1.323* (1.65)	1.596* (1.72)	1.423** (2.46)	1.084 (0.67)	1.544*** (2.74)
Credit rating	1.043 (1.22)	1.104*** (2.63)	1.049** (1.98)	1.073** (2.32)	1.054** (1.98)
Bank crisis in last 5 years	0.062*** (-3.16)	0.057*** (-3.03)	0.033*** (-4.11)	0.080*** (-2.85)	0.051*** (-4.13)
Small nation dummy	0.284** (-1.17)	0.358 (-0.90)	0.150* (-1.66)	0.522 (-0.65)	0.143* (-1.71)
Export concentration	1.049** (0.90)	1.124*** (3.38)	1.106** (4.02)	1.045 (0.79)	1.116*** (4.25)
Transition economy dummy	2.217 (0.42)	3.254 (0.76)	2.020 (0.43)	25.560 (1.10)	2.301 (0.48)
Time trend	0.762** (-3.71)	0.610*** (-4.05)	0.766*** (-5.39)	0.579*** (-5.32)	0.805*** (-3.63)
Threshold as share of world mean income	0.018 (-0.93)	0.001** (-2.54)	0.014 (-1.33)	0.001 (-1.23)	0.065 (-0.83)
Added regressor	0.805 (-0.62)	0.995 (-0.09)	1.019 (0.45)	1.195 (1.51)	1.006** (2.36)
Number of observations	411	223	437	337	437
Number of nations	32	30	34	29	34
Adj. pseudo-R ²	0.63	0.63	0.59	0.67	0.60
Correctly predicted	90.8%	88.8%	90.2%	91.1%	89.9%

All regressions are based on main sample. t-statistics are in parentheses beneath odds ratios; *indicates significance at the .10 level, **at the .05 level, and ***at the .01 level for two-tailed tests

observed). These models confirm some of the key results from the logit analyses, including the importance of institutional development and creditworthiness as predictors of graduation. Other variables that are significant predictors of graduation status in logit are not significant in survival hazard models of graduation, however; this may be due to the smaller sample of events rather than to any asymmetry in the graduation and de-graduation processes.

Equation 1 in Table 5 reports results from a Cox proportional hazards model of graduation. This model is commonly used when the impact of covariates, rather than

Table 5 Survival models for graduation

Equation	1	2	3	4	5
Method/Distribution	Cox PH	Cox PH	Exponential	Weibull	Loglogistic
Log of GNI per capita in excess of threshold	1.193 (0.47)	1.278 (0.46)	1.284 (0.55)	1.015 (0.04)	1.033 (0.12)
Over threshold 7+ years dummy	0.478 (-1.05)	2.330 (0.67)	2.478 (1.32)	1.923 (0.76)	0.076*** (-3.61)
Political freedoms	1.530** (2.25)	1.193 (1.33)	1.365* (1.95)	1.407* (1.88)	0.824** (-2.55)
Institutional capacity	0.925 (-0.28)				
Credit rating	1.059* (1.65)	1.088** (2.41)	1.071*** (2.91)	1.091*** (2.70)	0.906*** (-4.89)
Small nation dummy	1.801 (0.84)	1.712 (0.63)	1.301 (0.28)	1.707 (0.46)	1.730 (1.16)
Export concentration	1.134* (1.87)	1.011 (0.22)	1.014 (0.26)	1.017 (0.32)	0.982 (-0.96)
Transition economy dummy	1.048 (0.07)	0.601 (-0.85)	0.606 (-0.78)	0.634 (-0.67)	0.403 (-1.46)
Number of observations	127	170	170	170	170
Number of nations	21	24	24	24	24
Right-censored cases	9	10	10	10	10
Pseudo-R ²	0.22	0.22	0.34	0.37	0.48
AIC	55.0	64.7	48.8	49.8	46.0

t-statistics (in parentheses) are cluster-adjusted; coefficients are exponentiated to be interpretable as hazard ratios in equations 1–4 and time ratios in equation 5; *indicates significance at the .10 level, **at the .05 level, and ***at the .01 level for two-tailed tests

the structure of duration dependence, is of primary interest. It does not require specification of the baseline hazard, and the effect of regressors is simply to multiply the hazard function (which may vary with duration) by a scale factor. The hazard can change over time, but the hazard ratios (namely, the relative hazards for two observations differing by one unit on a regressor) are constant over time.

Three variables emerge as significant (or marginally significant) in equation 1: *Political Freedoms*, creditworthiness, and export concentration. The hazard ratios indicate that the hazard rate increases by 53% with each 1-unit increase in *Political Freedoms* and by 6% with each 1-unit increase in creditworthiness.²⁹ Other variables—most notably income and *Institutional Capacity*—that are often significant in the logit analysis of graduate status are not significant in the proportional hazards model.

²⁹ Hazard ratios are reported in the table, but the test statistics are computed from the unexponentiated regression coefficients. Hazard ratios are not directly comparable to odds ratios. The former is a ratio of probabilities, e.g., 40% to 20%, while the latter is a ratio of odds, e.g., 2-1 to 1-1. For those examples, they both equal 2. But a ratio of the two odds 10-1 and 5-1 equals 2, while the corresponding ratio of probabilities would be about 1.08 (roughly 90%/83%).

Equation 1 includes only 12 instances of graduation, as well as 9 other right-censored countries that do not graduate by the end of the period. By dropping *Institutional Capacity* in equation 2 and starting the analysis in 1979, when the creditworthiness data are first available, we can add more countries and years to the sample. Three countries are added: Greece (a 1979 graduate), Barbados (1994), and Seychelles (a non-graduate). In all, 43 observations (country-years) are added to the analysis between equation 1 and equation 2.

With the additional observations in equation 2, significance of creditworthiness strengthens, but export concentration loses significance. Figure 2 shows the estimated hazard function from this model, with all covariates but creditworthiness set at their mean values. Creditworthiness is set at two alternative values, 40 (at about the 25th percentile of sample values) and 60 (70th percentile). The gap between the solid and dashed lines shows the difference in hazards implied by low contrasted to high creditworthiness. This difference in creditworthiness and associated difference in hazards has a large cumulative effect on the estimated survival functions, shown in Fig. 3. The hazard is shown in Fig. 2 to increase initially with analysis time before leveling off after about 10 years.³⁰

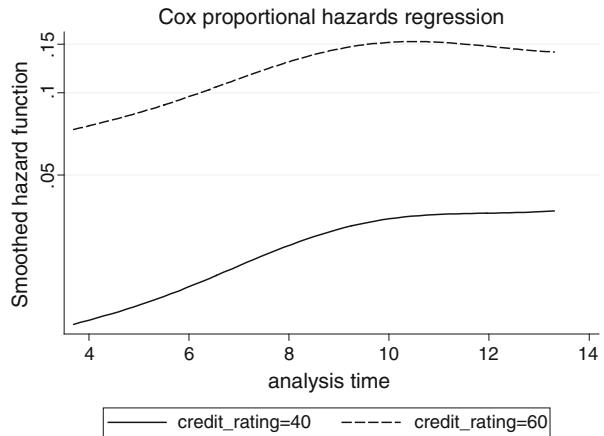
Equations 3–5 report results for parametric survival models that make particular assumptions about duration dependence, in contrast to the Cox proportional hazards model. Equation 3 reports an exponential regression model, imposing a constant hazard function over time. Creditworthiness and *Political Freedoms* both have positive and significant effects on the hazard rate.

The Weibull regression model in equation 4 imposes a monotonic hazard that either increases or decreases exponentially over time. Results are similar to those in equations 2 and 3, but with slightly higher hazard ratios estimated for creditworthiness and political freedoms. The parameter ρ exceeds 1 but not to a significant degree, which indicates that the exponential model's assumption that there is no duration dependence cannot confidently be rejected. The Akaike Information Criteria (AIC) is lower for the exponential model than for the Weibull model, indicating that the assumption of a constant hazard provides a better fit.

The loglogistic model in equation 5 imposes a non-monotonic hazard that first increases and then decreases with time. The AIC indicates this model provides a better fit than the exponential or Weibull models. Regression coefficients in the loglogistic model have a different interpretation, indicating whether time until failure (graduation, in our case) is decelerated (positive coefficient) or accelerated (negative coefficient) by the regressors. The negative t-statistics and time ratios below 1 for creditworthiness and political freedoms in equation 5 are thus consistent with our previous results. The time ratio of 0.91 for creditworthiness (or 0.82 for political freedoms) indicates that each 1-unit increase reduces expected time until graduation by 9% (or 18%). The dummy for 7-plus years over the income threshold is also highly significant in the loglogistic model.

³⁰ Note that analysis time is not identical to years over the threshold (which cannot be determined precisely for all observations). Moreover, this hazard profile is not comparable to the estimated effects of time over the threshold in the logit analysis. The former shows how the hazard—i.e., probability of graduating in a given year—changes with time, while the latter estimates the relation between time and the probability of being a graduate.

Fig. 2 Estimated hazard function for graduation, conditional on years above IBRD threshold and credit rating



While findings vary somewhat among these commonly used survival models, we obtain consistently positive results for creditworthiness and *Political Freedoms*. In the model that best fits the data (equation 5), one of the two income variables is also highly significant.

5.9 Factors Predicting Borrowing

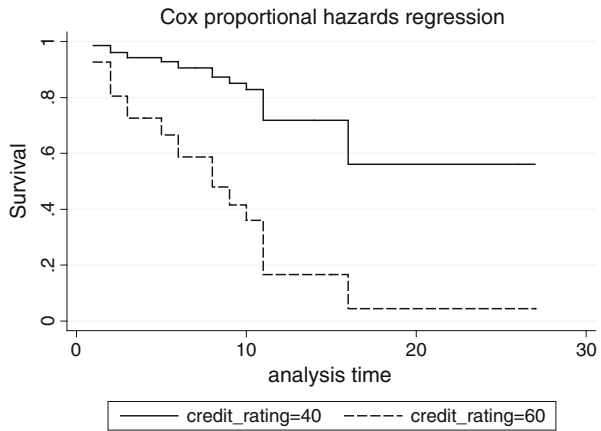
One way of assessing how above-threshold countries approach graduation is to see what factors predict their reliance on the IBRD for financing. While non-graduates retain their eligibility for borrowing, a country that has not graduated does not always borrow in any given year. Among the 166 country-year observations in our main sample in which a country had not graduated, new borrowing commitments were made 81 times.³¹ We therefore analyze whether the factors predicting graduation also help to explain the decision to borrow or not, and how much the country borrows. The sample is limited to non-graduate country-years during which the country exceeds the IBRD income threshold.

Table 6 presents logit estimates in which the dependent variable takes the value of 1 if the country borrows and 0 if it does not borrow in that year. If the same factors are at play for graduating as for borrowing, the coefficient estimates in Table 6 should have the opposite sign from those in Table 2.

Findings for the borrowing decision are consistent on several variables with the graduation results. In equations 1 (logit) and 2 (random effects logit), creditworthiness, export concentration, and greater length of time over the IBRD income threshold are all associated with a lower likelihood of borrowing from the IBRD. In equation 2, *Political Freedoms* also has the expected negative relationship with borrowing. Findings for other variables are not consistent with the graduation results. Countries that are very small or that have had recent

³¹ We include the actual year of graduation, because in several cases it coincides with the year of the final loan.

Fig. 3 Estimated survival function for graduation, conditional on years above IBRD threshold and credit rating



banking crises were less likely to graduate (as we saw in Table 2), but conditional on non-graduation are also less likely to borrow (Table 6, equation 1 and 2). Controlling for time over the threshold, higher income is associated with a higher probability of borrowing in equation 2. The transition dummy was not significant in the graduation regressions, but conditional on not graduating the transition economies are significantly less likely to borrow. The time trend in borrowing is negative but not significant.

When we look instead at the amounts borrowed, using (the log of) lending per capita as the dependent variable, we obtain similar results. Creditworthiness, export concentration, and the dummies for small nations, transition economies, and longer time over the threshold (7 or more years) are associated with significantly lower borrowing levels in tobit (equation 3) and random effects tobit (equation 4).³² Greater institutional capacity and political freedoms are not significant in these tests.

Overall, we interpret these results on borrowing as being broadly consistent with the results for graduation status. Several of the same variables that predict a greater probability of being a graduate also tend to predict reduced likelihood of borrowing from IBRD and lower amounts borrowed. These variables include creditworthiness, which doubtless incorporates judgments about the country’s level of institutional and political development (and may thus explain why those variables are not usually significant in the borrowing regressions). Because the most likely graduates—high-income countries with strong institutions and credit ratings—are also attractive low-risk borrowers from the standpoint of the Bank’s balance sheet, it is unlikely that the reduction in borrowing is driven by unwillingness of the Bank to lend to these countries. Therefore, these results are consistent with a graduation model that is evolutionary rather than abrupt: the factors that gradually reduce a country’s demand for IBRD loans also eventually lead it to graduate.

³² Fixed-effects tobit models cannot be estimated using conditional maximum likelihood, and unconditional fixed-effects tobit estimates are biased.

Table 6 Estimates for IBRD borrowing

Equation	1	2	3	4
Dependent var.	Borrow (Y/N)		Log of per capita amount	
Method	Logit	RE logit	Tobit	RE tobit
Constant			122.05 (1.48)	34.193 (0.39)
Log of GNI per capita in excess of threshold	1.470 (1.07)	2.906** (1.98)	0.267 (1.47)	0.279 (1.62)
Over threshold 7+ years dummy	0.191** (-2.25)	0.087** (-2.15)	-0.769* (-1.80)	-0.909** (-2.32)
Political freedoms	0.847 (-0.94)	0.590* (-1.74)	-0.040 (-0.55)	-0.120 (-0.109)
Institutional capacity	1.010 (0.04)	1.252 (0.89)	0.017 (0.18)	0.167 (1.56)
Credit rating	0.831*** (-4.25)	0.783*** (-2.75)	-0.124*** (-6.20)	-0.084*** (-2.70)
Bank crisis in last 5 years	0.134*** (-4.39)	0.099 (-1.54)	-0.876 (-1.54)	-0.249 (-0.45)
Small nation dummy	0.003*** (-6.46)	0.001*** (-3.02)	-2.917*** (-5.35)	-2.544*** (-2.86)
Export concentration	0.898*** (-3.42)	0.838** (-2.42)	-0.078*** (-3.45)	-0.058** (-2.34)
Transition economy dummy	0.081** (-2.32)	0.014** (-2.21)	-1.213*** (-3.08)	-1.689** (-2.26)
Time trend	0.899 (-1.38)	0.833 (-1.52)	-0.056 (-1.38)	-0.015 (-0.34)
Threshold as share of world mean income	0.009 (-1.51)	0.004 (-0.85)	-2.399 (-1.11)	-0.051 (-0.02)
Number of observations	166	166	166	166
Number of censored observations	-	-	85	85
Number of nations	27	27	27	27
Adj. pseudo-R ²	0.50	0.57	0.22	0.21
Correctly predicted	80.4%	-	-	-

All regressions are based on main sample; t-statistics (cluster adjusted in equations 1 and 3) are in parentheses beneath odds ratios in equations 1–2 and tobit coefficients in equations 3–4; *indicates significance at the .10 level, **at the .05 level, and ***at the .01 level for two-tailed tests

6 Conclusion

In this paper, we have presented what is to our knowledge the first attempt to model empirically the correlates of IBRD graduation status. Under Bank policy, graduation from IBRD is not an automatic consequence of reaching a particular

income level, and the IBRD per-capita income threshold is used only as a trigger to initiate discussions about the country's readiness. Graduation is instead supposed to be based on a determination of whether the country has reached a level of institutional development and capital-market access that enables it to sustain its own development process without recourse to Bank funding.

We assess how this policy is implemented in practice through logit analysis of panel data for 34 countries that borrowed from the IBRD at some time after 1970. We find that the observed correlates of Bank graduation status are generally consistent with the stated policy. Among the countries that have crossed the IBRD income threshold (currently \$6885), those that are wealthier, more institutionally developed, and less vulnerable to trade, financial, and other shocks are more likely to be graduates. Results are robust to using alternative measures of income and institutional development, and to expanding the sample to include all country-years over the income threshold, rather than just those that have borrowed since 1970.

With a relatively few variables, the logit model is able to predict correctly the IBRD graduation status of a country in a high percentage of cases. Predicted probabilities generated by the model conform closely to the actual graduation and de-graduation experiences of Trinidad and Tobago and Korea, among other countries. They also suggest that Hungary and Latvia graduated prematurely—a prediction subsequently borne out by their return to borrowing from the IBRD in the wake of the global financial crisis. Moreover, these cases suggest that the strong assumption of symmetry between graduation and de-graduation implicit in the logit model of graduation status is not entirely implausible. Predicted probabilities of being a graduate generated by the model decline around the time of de-graduation for Hungary, Latvia, Korea, and Trinidad and Tobago, and the decline is very sharp in the latter two cases. The explanatory variables in the model appear to be important predictors of de-graduation as well as graduation.

Hazard models of graduation confirm the importance of creditworthiness and political freedoms as predictors of graduation. Because there are so few cases of de-graduation, it is not feasible to run similar hazard models for the return to IBRD borrowing. The six cases of de-graduation in our sample—although predicted reasonably well in the logit model—all closely followed exogenous shocks that undermined creditworthiness. However, not all countries exposed to such shocks resort to borrowing from the IBRD, and institutional development among other factors likely plays a role in countries' resilience to shocks.

We supplement the analyses of graduation status with analyses of whether or not a country borrows from the IBRD (a discrete variable) and, if it does, its level of borrowing from the Bank (a continuous variable). Interestingly, the findings are largely consistent with the analysis of the (discrete) graduation status variable: countries that are above the threshold for a sustained period and are more creditworthy tend to rely less on IBRD financing for their development needs. These findings are consistent with the expectation under the policy that as an eligible borrower develops, it will have less need for IBRD assistance and thus will be ready for graduation.

Appendix 1: Countries in main sample with graduation dates (events in bold are included in the 1982–2009 logit analysis)

Country	Graduation	Degraduation ¹
Argentina		
Bahamas ²	1989	
Bahrain		
Brazil		
Chile		
Croatia		
Cyprus	1992	
Czech Rep.	2005	
Estonia	2006	
Finland	1975	
Gabon	1977	1988
Greece ³	1979	
Hungary	2007	2009
Iceland	1974	
Ireland	1976	
Israel	1975	
Korea	1995	1998
Latvia	2007	2009
Lithuania	2006	
Malaysia		
Mexico		
Oman	1987	
Poland		
Portugal	1989	
Romania		
Russia		
Singapore	1975	
Slovak Rep.	2008	
Slovenia	2004	
Spain	1977	
Trinidad & Tobago	1984	1990
Turkey		
Uruguay		
Venezuela	1974	1989

¹Degraduation includes all cases of borrowing following graduation, whether or not a formal process of degradation occurred. Two de-graduates are excluded from the analysis due to missing data: Iraq graduated in 1973 and borrowed again in 2003, but is missing data on per capita income; and Barbados graduated in 1994 and borrowed again in 2001, but is missing data on ICRG, so can be included only in equation 4 of Table 3, and equations 2–5 of Table 5

²Bahamas is missing data on creditworthiness prior to 2000, so only post-graduation years are included in the analysis

³Greece's graduation is included in the survival models of equations 2–5 in Table 5

Appendix 2: Additional countries in the expanded sample¹

Australia	Italy	Norway
Austria	Japan	Saudi Arabia
Belgium	Kuwait	Sweden
Canada	Luxembourg	Switzerland
Denmark	Malta	UAE
France	Netherlands	UK
Germany	New Zealand	USA

¹These countries exceeded the IBRD income threshold in every year from 1982 onward, and either had graduated by 1972 or never borrowed

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