ASIAN INFRASTRUCTURE INVESTMENT BANK

Deficits and Crowding Out Through Private Loan Spreads

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Abstract

Post crisis, bank loan spreads increased and have remained elevated despite central bank actions, low LIBOR rates and observed Treasury yields. Using large syndicated loan dataset, this paper estimates that a one percentage point to GDP increase in government deficits increases spreads by around nine basis points on average. This is consistent with partial crowding out. Weaker country risk ratings, larger loan size also increase spreads. Finally, the paper provides evidence that US deficit spending results in a crowding out of around one-half in loan markets and have some crowding out of loans in other markets.

Keywords: Interest rate, government deficit, banking, crowding out

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1 Introduction

As government spending is a core component of aggregate demand, governments tend to boost demand through deficit financed spending when private sector demand is weak. Economic theory has long suggested that increased government spending could potentially crowd out the private sector. Traditionally, the crowding out channel is understood to operate through increase in government bond yields, which then affects the cost of borrowing in the rest of the economy. However, post crisis, government bond yields have been held low by actions of central banks, even as governments registered large deficits. Yet there has been relatively little analysis on how government deficits have affected private sector credit spreads. This paper thus examines the impact deficits have on spreads and identifies another crowding out channel.

1.1 High Government Deficits and Ultra-Low Interest Rates in 2010s

In 2009, during the financial crisis, the US government's primary deficit rose to 11 percent of GDP (highest peacetime level). The primary deficit remained high in the years post crisis, while US national debts also rose substantially to more than 80 percent of GDP. European economies experienced very similar trajectories. On the other hand, interest rates remained low for much of the decade post crisis with the (London) Interbank Offer Rate (LIBOR), Euro Interbank Offered Rate (EURIBOR) and yields on 1-year US Treasuries (UST) hovering below 2 percent (see Figure 1). On the face of it, higher deficits had not been accompanied with higher interest rates.

Figure 1: Annual Average Rates or Yields of 1-Year Libor, 1-Year Euribor, 1-Year and 10-Year UST (1991-2017)

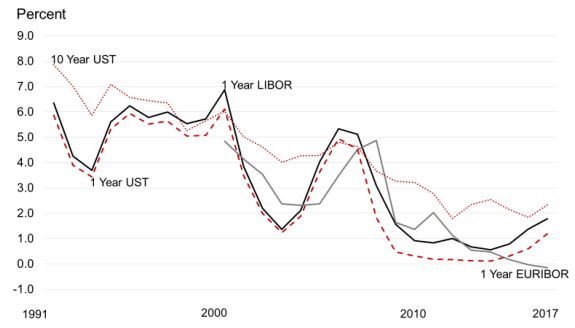
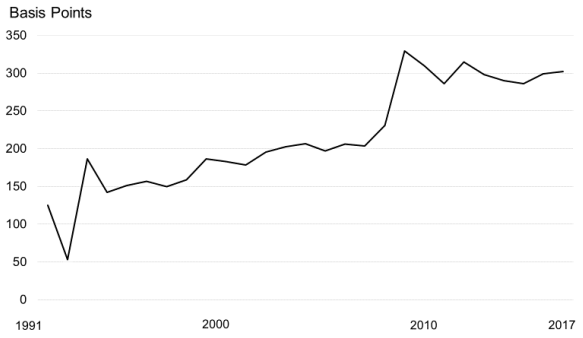


Figure 2: Annual Average Spreads (1991-2017)



A key reason for this is that central banks undertook aggressive monetary easing popularly known as "Quantitative Easing" or QE, combining ultra-low or even negative interest rates (in Europe) with outright purchases of long-dated government securities (and in some instances even commercial papers) to stimulate economic growth.

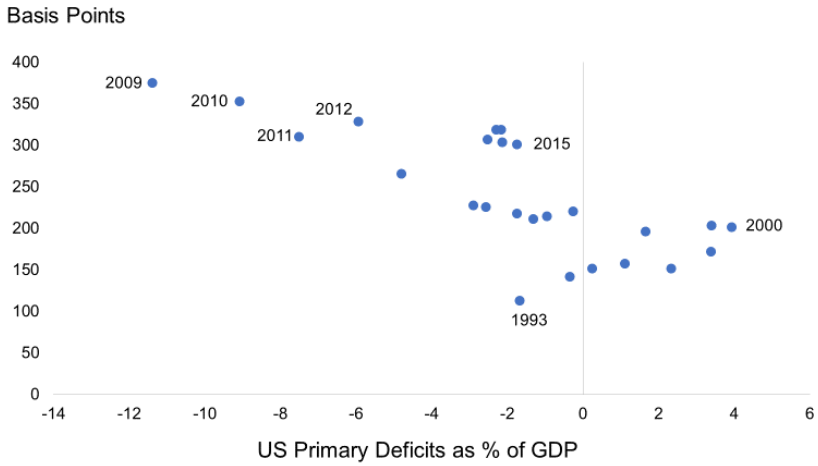
1.2 Increasing Credit Spreads and Diverging Borrowing Costs

Notwithstanding the actions of central banks, credit spreads in the syndicated loan market spiked by around 100-150 basis points in 2009 and remained elevated at around 300 basis

points above reference rates for much of the past decade (see Figure 2).[1] Borrowing costs in the private sector loan market were not as low as headline interest rates suggested. This divergence between borrowing costs faced by firms, and by government, has non-trivial economic implications. (Blanchard O. , 2019) argued that "fiscal policy is costless" because the risk-free interest rate was low enough to facilitate intergenerational transfers without a large loss on future productivity, while (Mankiw & Weinzierl, 2011) on the other hand argued that government expenditure could not replicate private consumption and would come with welfare costs. This debate has sharpened, as a larger gap between the risk-free interest rate faced by government and what is faced by private borrowers (assuming private sector has not become riskier) creates stronger incentives for the reallocation of resources from private to public, making public debts even more costly in welfare terms.

The key question is whether the large spreads are due to post-crisis fiscal expansion, high country debts, and risks. Focusing only on US syndicated loans, there appears to be a relationship between government deficits and average credit spreads (see Figure 3). The divergence between loan spreads and interest rates, and the correlation between deficits and spreads, motivate this paper.

Figure 3: Average Spreads of US Syndicated Loans and US Primary Deficits as % of GDP



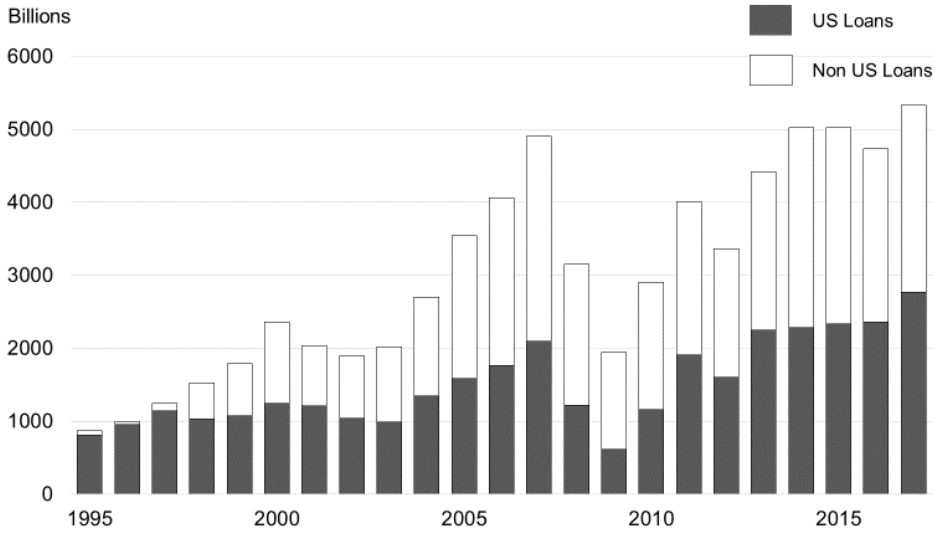
1.3 Syndicated Loan Market

The syndicated loan market is a large global market for credit, with close to USD5 trillion a year of bank loans conducted through syndication (Thomson Reuters, 2018), see Figure 4.[2] For 2017, US and non-US loans are each around half the market, at USD2.77 trillion and USD2.57 trillion respectively.

[1] (Lim, Minton, & Weusbach, 2014) suggested that syndicated loan spreads rose because of the presence of non-bank institutional investors, which demanded higher returns.

[2] Note that the figure here includes all transactions, including those with incomplete data. Around 50 percent of the sample points, covering around one-third of transaction value, do not have complete data and hence are not included in subsequent regressions.

Figure 4: Syndicated Loans in USD (1995-2017)



Often the financing needs of corporates cannot be met by a single bank lender and will have to be shared (or syndicated) across a pool of bank lenders.[3] It is international in nature, with the syndicate of banks that do not always belong to the same national entity or the same national entity as the borrower.

Subject to overcoming informational asymmetry which would hinder transactions, syndication typically expands credit availability. It enables originating banks or lead lenders to reduce their exposures to borrower-related risks by sharing part of the loans across the syndicate [see (Simons, 1993) (Dennis & Mullineaux, 2000)]. The lead bank (or lead banks) would usually require other participating banks to pay an upfront fee. Non-lead banks participating in the syndicate are then able to lend to borrowers they would not normally have access to. Large borrowings would typically require some form of syndication, to overcome constraints on countries or sectors, on single borrower risk limits within each lender and also on capital in the case of large deals. More participating lenders can also add to monitoring and increase reputational costs to borrowers should they default, thus encouraging good behavior.

A useful feature of syndication is that participating banks would usually have covenants that enable them to sell their respective portions to other financiers during the course of the loan, without affecting the borrower or other lenders in the syndicate. This creates a secondary market for loans and offers considerable flexibility for bankers to adjust their portfolios. Syndication also provides diversification for the borrowers, by allowing them to build up relationships with a larger pool of bankers. Note that it is possible for a syndicated loan deal not to be able to attract other lenders. The lead bank ends up underwriting the loan and becomes the single lender.

(Altunbas, Alper, & Marquez-Ibanez, 2009) argued that syndicated loans filled an important position between bilateral bank loans and public bonds and allowed large debts to be financed in situations where bank monitoring was essential. They also showed that the syndicated loan market in Europe increased significantly since the introduction of the Euro.

[3] Note that there are non-bank lenders in the syndicated loan market. This paper does not make a distinction between bank and non-bank lenders. For brevity, the rest of the paper will use the term “banks” to refer to all lenders.

Exploiting transaction data in the large syndicated loan market where borrowing costs can be separated into the reference rate and credit spread components, this paper attempts to shed new light to an old empirical question—whether government deficits lead to higher borrowing costs? Focusing on loan spreads provides new insights into possible crowding out through the loan market. The large dataset also allows for the impact of various loan characteristics and macroeconomic factors to be estimated. The paper also provides some evidence of how US deficits have an impact on spreads even for non-US loans.

This paper is structured as follows. Section 2 reviews literature on the impact of deficit spending on interest rates. Section 3 provides a richer description of the dataset of syndicated loans. Section 4 presents the series of regressions, and the results and policy implications are discussed in Section 5. Section 6 concludes.

2 Literature Review

The effect of government deficit spending on private investment received a lot of attention in the economic literature over the decades, with ebb and flow. There were many discussions on US government deficits in 1970s (Friedman, 1978) (Goldfeld, Kareken, & Hamburger, 1978), which continued into the 1980s and early 1990s with the deficits during the Reagan era (Hoelscher, 1983) (Wachtel & Young, 1987) (Barro, 1989) (Yellen, 1989) but became more dormant during the mid-1990s as US' fiscal health improved considerably. Most recently and post crisis, debate centered around the appropriateness of fiscal policies in the aftermath of the economic crisis (Mankiw & Weinzierl, 2011), on fiscal multipliers (Blanchard & Leigh, 2013), and also on the impact of large public debts, interest rates, and welfare (Feldstein, 2016) (Blanchard O. , 2019).[4]

Much of the literature has pitted Ricardian equivalence against the Keynesian framework. The former points to deficits having no net impact on consumption, current account and (real) interest rates. There are many reasons why strict equivalence does not hold, but early empirical research into this had not been conclusive. As noted by Barro (1989), "Basically, the results are all over the map, with some favoring Ricardian equivalence, and others not."[5]

Most studies focused on the impact of deficit spending on treasury yields [(Hoelscher, 1983) (Wachtel & Young, 1987) (Khan, 1988) (Engen & Hubbard, 2004)]. A key reason is the presence of confounding factors, as interest rates are affected by central bank actions and deficit spending tends to occur during recessions when central banks would lower interest rates. Barro (1989) summarized the difficulty in identification, "deficits and savings (or investment) have strong cyclical elements, and it is difficult to sort out the causation in these patterns." There were attempts to account for different types of deficits (structural versus cyclical), with the general conclusion that structural deficits did increase interest rate [see (Barth, Iden, & Russek, 1985) (Hoelscher, 1983), (Khan, 1988), (Aisen & Hauner, 2008)].

Later researches were also careful about the role of expectations and possible counterfactuals. (Laubach, 2004) pointed to how expectations about deficits would affect

[4] The recent tax cuts under the Trump administration has also resulted in a large government deficit under conditions of full or close to full employment. It is widely expected to result in higher interest rates though the academic literature has yet to provide a consensus around this.

[5] To be clear, this paper focuses on the impact of deficits on borrowing costs, and not the other aspects of Ricardian equivalence.

future interest rates. (Gale & Orszag, 2004) provided a very comprehensive discussion by accounting for expectations of future fiscal policy and debts on long-term interest and forward interest rates, as well as effects of various macroeconomic variables, including those related to monetary policies. The general conclusion from these studies is that government deficits (and projected deficits) did raise interest rate—a one percentage point to GDP increase in projected future primary deficit would raise interest rate by 40 to 70 basis points, and even larger if other factors such as national debts were accounted for.[6]

2.1 Contribution of this Paper

This paper adds to this discussion by estimating the impact of government deficits on loan credit spreads, as opposed to yields on treasuries or on LIBOR, adding to the understanding on crowding out. The dataset used here also differs from existing ones in several aspects. As mentioned, a key advantage of this dataset is that borrowing cost is broken down into two parts—the reference rate and credit spreads—giving increased confidence that the coefficients estimated are free of confounding effects.

Second, the size of the dataset is also a significant advantage, allowing the research to incorporate various country, sector fixed effects, as well as other covariates. For example, loan size, tenor, diversification and the effects of other macroeconomic covariates can be included and controlled for. Third, while the dataset has many US transactions, it also includes many non-US transactions. As can be seen later, a set of regressions leverages on this and tests for effects of US government deficits on other countries.

3 Data

The study makes use of the extensive database on loans in Thomson Reuters. There are altogether around 290,000 data points covering all sectors, across the sample period 1990-2017. Each data point contains information such as the year in which the deal occurred, name of the borrower, the borrower's economic sector, the country of operation, the lenders (including lead bank(s) and other bank(s) in the syndication). Each complete data point would also contain information on the terms of borrowing—the amount, the currency, the reference interest rate, and the spread above this reference interest rate. However, not all samples have complete data, and the treatment for this will be discussed later.

3.1 Borrowing Cost

There are two main types of loan pricing—fixed or floating. Starting with floating loans, the borrowing cost takes on a fixed spread, which floats above the reference rate. In other words, borrowing cost equals to reference rate plus (fixed) spreads. If the spread is 200 basis points, it will be on top of the reference rate. The most common reference rate is LIBOR (almost half of all samples). The other reference rates are EURIBOR (for funding in Euros), Tokyo LIBOR (TIBOR), Singapore and Hong Kong, China IBORs, but these have relatively small shares in the market compared to LIBOR and they generally move in the same direction. Henceforth,

[6] Natural experiments offer a way out of this empirical difficulty [see (Fuchs-Schuendeln & Hassan, 2016) for review of natural experiments around fiscal multipliers]. But as it is well noted, such studies offer rich insights but often ignore general equilibrium effects and are more difficult to generalize. Not directly related to deficits, but (Acharya, Eisert, Eufinger, & Hirsch, 2018) studied the effects for crisis-hit countries in Europe and found convincing evidence that loans to private sector were reduced when banks had the incentives to shift to risky government bonds.

the paper will use LIBOR and reference rate interchangeably (unless the specific non-LIBOR reference rate is stated).

The LIBOR refers to what banks borrow or lend to each other in the wholesale market. This reflects to banks' funding cost.[7] The assumption is that spreads then reflect the bank's margin, which consists of credit risks, liquidity risks, and due diligence administrative and capital costs, as well as profit margin.

Fixed rate loans on the other hand is as the name suggests, rates are fixed during the tenor of the loan. Fixed rate loans are relatively rare before the financial crisis of 2008/2009. Post crisis, there were more fixed rate loans as borrowers locked in lower rates in the post-crisis period. But the number of transactions with fixed rates remained small compared to floating ones. On average, fixed rate loans will have a higher loan pricing or spread, as interest rate risks are transferred to lenders. As monetary policy normalizes and the market moves away from ultra-low interest rates, it is likely that the number of fixed interest rate loans will decrease.

The separation of borrowing cost into these two components is the key. The assumption is that monetary policies would affect LIBOR but have no direct impact on spreads (of course, regulatory policies will continue to affect spreads). The impact of fiscal deficits on borrowing costs can be identified without having to deal with confounding factors.[8]

3.2 Principal Sum and Tranches, and Instrumental Variable

Each data point is a standalone deal, or part of a larger deal. For standalone deals, the "Principal sum" would be equal to the "Proceeds", as there is only a single tranche of loan. However, for some large-sized deals, each data point (or each tranche) is part of a larger deal. To give a concrete example, the principal sum—which is the size of the whole deal—could be USD500 million but broken into several tranches of proceeds, for example USD200 million, USD200 million and USD100 million. When this happens, it is recorded as three sample points.

This is a very useful feature. Firstly, different tranches could occur in different years, with different spreads, and under different economic circumstances. This enlarges the dataset in terms of sample points and results in more variation that helps with the regressions. Secondly, the number of tranches is positively correlated to the size of the deals. Hence, the number of tranches serves as a very useful instrument variable that can be exploited as the number of tranches should not have a bearing on spreads, except to reflect large deals.

3.3 Years to Maturity

The start date of the loan—called the closing date—is recorded for each data point, together with the maturity date. This makes it possible for the years to maturity or tenor for each loan to be computed.

3.4 Country Risk and Deal-Specific Ratings

[7] While each sample point informs on which reference rate is used for pricing, it does not in fact contain the actual data of the reference rate. Nevertheless, this is not a major issue as data on reference rates (say LIBOR) is easily available.

[8] To frame this using IS-LM model as an analogue. The outward shift of the IS curve will in principle lead to an increase in interest rates. However, the effect can be confounded by changes in monetary policy and the LM curve. The assumption is that the reference rate will absorb the effects of monetary policy, leaving the spreads relatively free of confounding effects.

Rating agencies have an influence on credit spreads. To clarify, there are two types of ratings—one that is specific to the deal, and another that is for the sovereign.

Issue-specific rating is a rating that is assigned to the borrower's syndicated loan in the deal. This is a variable in the Thomson Reuters dataset. In the issue-specific rating, the rating agency will typically look for factors such as the financial strength of the borrower, whether the syndicated loan deal is robust in downside scenarios and provides the lenders with sufficient protection.[9] Borrowers may seek ratings to provide a third-party assessment, which can enable them to widen their pool of lenders. The issue-specific rating data is the dataset is highly incomplete, with only a small minority of deals having gone through the rating process.

Country-specific rating is more widely known. Rating agencies will provide ratings for each country based on macroeconomic and institutional risk factors. Country ratings are not in the Thomson Reuter dataset, but this is obtained and merged into it based on the year-country match.

A key point to note is that rating agencies often set a ceiling where the issue-specific rating could not be higher than the borrowing entity's country rating. This is particularly true for sectors that are known to require significant sovereign support (for example, the banking sector in some countries). A highly useful feature of country ratings is that these provide useful information on the longer-term debt sustainability of countries, beyond the short-term government deficits. This allows regressions to separate out the deficits' impact on spreads, versus the channel where deficits lead to greater concerns over long term sustainability (which show up in country ratings).

The country ratings of Standard and Poor's (S&P) is used as the benchmark for country as well as issue-specific ratings. Ratings range from "AAA" to "D", across 24 notches. To operationalize the regressions, each notch is converted into a numerical scale, with "AAA" as 1, "AA+" as 2, so on until "D" which is default and takes the value of 24. The expected regression sign on spreads is therefore negative.[10]

3.5 Impact of Basel Regulations

Basel is a set of international banking regulations developed by the Bank for International Settlements. The regulations set out the capital that banks need to hold against their assets in order to maintain financial stability. Riskier assets attract higher capital ratios which then translate into higher opportunity cost to banks. There are other capital requirements for countercyclicality, and also regulations aimed at improving risk supervision and disclosure. These in general add to the opportunity as well as administrative costs for banks, which is reflected in spreads.

Basel II was announced in 2004, though full implementation took a few years. Post crisis, it was widely recognized that banks needed to hold more capital and Basel III was announced in 2011 with considerable strengthening of supervision and capital requirements (but again, full implementation took a few years) (Bank for International Settlement, 2011). It is important

[9] In certain instances, rating agencies will also look at the strength of the borrower's customers. An example would be where the loan is taken out for capital expansion that serves a specific customer.

[10] Only 48,000 samples, out of 290,000 have a deal-specific rating. As a result, the paper does not incorporate issue-specific ratings into regressions. Instead, the presence of an issue-specific rating is given as an indicator. Issue-specific ratings also take a similar 24-notch scale. However, as the number of deals rated by S&P (or any other rating agency) form a small subset of the dataset, the paper does not convert deal-specific ratings into a scale suitable for regression. Instead, the presence of an issue-specific rating is given as an indicator.

to account for the impact of Basel. The cost of such regulation is unobserved, though it is expected that Basel III will result in an increase of spreads by around 50 basis point (Ma, 2016). While the exact cost is unobserved, the paper introduces indicator variables for post-2004 samples (for Basel II) and post-2011 samples to account for the effects.

3.6 Number of Banks

The most interesting aspect of the dataset is perhaps the record of the banks participating in each deal. Banks either participate as a bookrunner, or mandated arranger. The bookrunner is the bank(s) leading the deal, or lead bank(s), while mandated arrangers are other banks participating in the syndication. From the dataset, one is unfortunately unable to tell how much funding each bank in the syndicate is providing to the deal (i.e., no information on loan shares). However, it is possible to count the total number of banks in each deal (bookrunners and mandated arrangers) and record this as a variable. A priori, the number of banks in the syndication should reduce spreads due to diversification.[11]

3.7 Macroeconomic Data

Macroeconomic data is obtained from IMF database. These are very standard data such as GDP growth, per capita GDP, inflation, current account, government expenditures and revenues etc., that are merged into the loan dataset. In the regressions, the government expenditures and government revenues, or net primary borrowing (all expressed as a percentage of GDP) are used to account for effects of deficits.[12]

3.8 Data Limitations

While the paper has a large dataset to work with, there are also data limitations. For example, around 50 percent of the loan data (covering roughly a third of loan values) did not have a spread recorded (i.e., missing dependent variable). The paper does not make any attempts to correct for this.

Some samples have dates missing but this can largely be overcome using transaction numbers. The transaction number of each deal is in running order, and this allows the missing date to be reasonably inferred by referencing to the transaction dates around the same number sequence.

The dataset does not capture important loan characteristics that would affect spreads. For example, the type and strength of the collaterals—usually important in pricing the spreads of the loans—are not recorded. Similarly, the financial strength and the credit history of the borrower would also influence spreads but are also not recorded in the data. The dataset also does not capture the shares of the deal taken up by each of the lenders.

After some cleaning up, there are more than 100,000 sample points with complete data that can be used for the regressions.

[11] A natural question is whether the higher spreads observed post crisis is due to lower syndication intensity perhaps because of higher information asymmetry between bankers. In fact, the data show that the average number of banks per deal rose from 3 in 2007 (before crisis) to 3.87 (post crisis). This is consistent with the idea that banks facing capital shocks syndicated more to maintain business (Ivashina & Scharfstein, 2010).

[12] The two variables can be collapsed into one—net borrowing requirements of the public sector. This yields consistent results in the regressions. Nevertheless, separating in expenditures and revenues allows the transmission channel to be better identified.

4 Regressions

In this section, the paper explains the motivation behind a series of regressions, starting from the most parsimonious to regressions with more covariates. This allows readers to see how the coefficient estimates change across various regression settings, improving the level of confidence in the overall result. As with (Gale & Orszag, 2004) and other studies, the regression structure is generic and takes the following reduced form:

$$r_{i,t,n} = \boldsymbol{\alpha} + \theta \boldsymbol{X}_n + \mu \boldsymbol{Z}_{i,t} + \varepsilon_{i,t,n}$$

Where $r_{i,t,n}$ is the spread for transaction n in country i and time t; $\boldsymbol{\alpha}$ is the vector of possible fixed effects (e.g., country; sectors); $\boldsymbol{X}$ is the vector of loan characteristics (including fixed effects to account for Basel regulations); $\boldsymbol{Z}$ the vector of macroeconomic data (including government revenues and expenditures) of country i at time t. Note that unlike other studies, this is a cross sectional rather than time-series regression. The error term is taken as white noise.

4.1 Regression for Spreads

Regression (1) is kept very simple. Credit spreads are regressed against government expenditures and revenues (measured as percentages of GDP) in a simple OLS. This gives readers a sense of direction and magnitude, with no other factors controlled for.

Regression (2) includes fixed effects for countries, sectors, and loan types (fixed or floating) to account for some basic heterogeneity. The fixed effects coefficients are not shown (for brevity) unless they present useful economic interpretations beyond accounting for heterogeneity. From regression (2) onward, Basel II and Basel III fixed effects are also included.

Regression (3) includes country rating by S&P. As country rating accounts for country heterogeneity, country fixed effects are excluded in regressions that include country ratings. In fact, country rating is a better variable that also captures how a country's risk changes over time. This allows the regression to be clearer on how spreads are affected by deficit spending—through higher perceived country risks, or through the more standard channel of crowding out. A few caveats are important here. In employing country risk ratings, the paper assumes that the 24-point linear numerical scale would be a good approximate to measure country risks.[13]

Thus far, the regressions have not involved many loan characteristics, aside for some basic sector, loan-type fixed effects. If loan characteristics are largely orthogonal to macroeconomic variables such as government deficits, such an omission would not pose a major issue, but this cannot be a priori assured. There are a few important loan characteristics that need to be properly addressed.

Firstly, the size of the loans will affect spreads. In theory, larger loans will have higher credit spreads, as these are more likely to bump into a bank's sector risk limits, single borrower risk

[13] This may not be the case. It is often noticed in the market that risk pricing is exponential. This may be due to the need for banks to set aside an escalating amount of capital with riskier loans, for regulatory reasons. In other words, capital costs for banks increase with risks, and this will be reflected in escalating spreads. In regression, the squared term of ratings can be used to account for this. In the end, the effect of the squared term is found to be very small and is thus omitted.

limit, liquidity constraints etc. Or it could simply be that larger projects are riskier in nature. Even with syndication and hence diversification of risks and relaxing of liquidity constraints, syndication itself presents overheads costs (legal, compliance, due diligence, coordination costs) to various lending parties. Again, this will show up as higher spreads.

However, there is also an endogeneity issue here—namely that higher spreads will reduce the demand from borrowers for large deals. The inclusion of deal size must therefore account for this endogeneity. In this paper, as with (Thia, 2019), this is dealt with by a two-stage instrumental variable regression, where the deal size is instrumented for by the number of tranches. The number of tranches correlates positively with deal size but should not in principle affect credit spreads directly.

Secondly, the number of syndicating lenders is included in the regression. The a priori is that more banks in syndication would reduce spreads through diversification of risks (once the deal size is accounted for). The inclusion of these loan characteristics forms the basis of regression (4). Another important characteristic of a loan is its tenor. Generally, long-tenor loans are pricier, as they tie up a bank's capital. In some cases, longer tenors also attract higher risk weightings, which implies higher regulatory capital that the banks need to maintain. However, in regressions, tenor is found to have only a very small positive impact on spreads. One reason could be that because of the constraint posed by long-tenor loans, banks will typically lend in shorter tenors and pass on refinancing risks to the borrowers. Of the samples, 82 percent have a tenor that is 6 years or shorter (mean tenor is 4.7 years).[14] There might not be sufficient tenor variation (especially at the long end) to really test the effects of tenor.

Regression (5) includes the full set of macroeconomic covariates, unemployment rate, total government debt to GDP, and inflation. Total government debt is added as an additional control, "since it is conceivable that both stock and flow measures of fiscal policy matter," see (Gale & Orszag, 2004). Note that S&P country ratings will also capture perceived country risks given the level of public debts, thus accounting for expectations as well.[15] Inflation is also added as a control but there is no further addition of any monetary policy variables.

One important macroeconomic variable is unemployment rate, which is a good proxy for the business cycle. The paper argues that focusing on spreads allows one to ignore confounding effects of central banks. However, one still has to be concerned about potential business cycle effects on spreads itself. The unemployment rate is high during downturns, which implies lower loan demand. The expected sign on loan spreads is therefore negative if loan demand is correlated with the business cycle.[16]

The results of regressions (1) to (5) are presented in Table 1. There are further regressions to account for cross border effects to be discussed later.

[14] This implies that borrowers will have to bear refinancing risks for some projects.
[15] Note that many developed countries, including the US, lost their AAA rating in the aftermath of the financial crisis of late 2000s.
[16] It can be seen later that the business cycle effect is pronounced for the US.

Table 1: Regressions of Spreads (basis points) on Macro and Loan Characteristics

	1	2	3	4	5
Government expenditure	11.06	10.88	8.28	10.64	8.51
(% of GDP)	0.11	0.20	0.11	0.16	0.25
	97.91	55.62	72.46	66.09	34.54
Government revenue	-8.64	-3.95	-6.05	-10.74	-9.72
(% of GDP)	0.13	0.24	0.12	0.19	0.23
	-68.82	-16.35	-49.34	-56.52	-42.90
S&P Country Rating			0.38	5.53	4.15
			0.21	0.28	0.36
			1.80	20.09	11.56
Unemployment rate (%)					2.61
					0.29
					8.88
Government debt					0.33
(% of GDP)					0.02
					13.30
Inflation					1.56
					0.29
					5.36
Loan type		-170.19	-175.75	-162.59	-161.13
		16.64	17.23	18.50	19.05
		-10.23	-10.20	-8.79	-8.46
Basel II (2005 onwards)		35.12	36.52	50.96	49.42
		1.05	1.00	1.37	1.41
		33.45	36.43	37.31	35.07
Basel III (2011 onwards)		88.05	94.57	117.07	108.91
		1.09	1.01	1.40	1.63
		80.66	93.32	83.63	66.96
Deal size (log)				99.52	108.04
				2.14	2.22
				46.57	48.76
Number of banks				-33.71	-35.35
				0.54	0.57
				-62.73	-62.50
Tenor				1.46	1.15
				0.23	0.23
				6.45	5.12
Observations	148729	148729	148066	129723	127586
Prob > F	0.00	0.00	0.00	0.00	0.00
R-square	0.064	0.191	0.150	.	.
Country fixed effects	No	Yes	No	No	No
Sector fixed effects	No	Yes	Yes	Yes	Yes
Presence of deal rating	No	No	Yes	Yes	Yes
Intruments	No	No	No	Tranches; GDP per capita (logs)	Tranches; GDP per capita (logs)

Standard errors and t statistics provided in the second and third rows below respective coefficients

4.2 Regression for Loan Proceeds

Thus far, the regressions described pertain to impact of government deficits on credit spreads. In this subsection, the paper discusses some regressions that attempt to uncover how sensitive loan sizes are to spreads—which is key to crowding out.

In regression (6), the dependent variable is loan proceeds (in logs), with GDP (in logs) for market size, per capita GDP in logs (proxy for market development) and spreads as the explanatory variables. This is the most basic of this set of regressions, to provide readers a sense of magnitude and direction.

As discussed, spreads will be endogenous to loan size, and spreads are instrumented for by loan characteristics as well as macroeconomic variables in regression (7). The instruments are government expenditures, revenues, and debts, inflation, and fixed effects of Basel. These are assumed not to affect loan size directly, other than through the effects on spreads. There are certain loan characteristics that would likely have direct effects on both loan proceeds and spreads (e.g., number of syndicating lenders, tenor), and these are not used as instruments. Regression (7) is for US transactions, while regression (8) for non-US. Regression (9) is the narrowest subset, with only EURIBOR transactions. Results are in Table 2.

Table 2: Regressions of Spreads on Loan Size

	6	7	8	9
Spreads (basis points)	-0.00194 0.00002 -78.36000	-0.00157 0.00023 -6.96000	-0.00083 0.00012 -6.99000	-0.00419 0.00022 -18.80000
GDP (logs)	0.08 0.00 27.38	0.35 1.13 0.31	0.05 0.01 8.16	-0.03 0.01 -2.27
Per capita GDP (logs)	0.11 0.00 163.21	-0.74 1.39 -0.53	0.19 0.01 25.23	0.45 0.03 15.08
Number of banks	0.22 0.00 163.21	0.30 0.00 61.83	0.18 0.00 96.07	0.19 0.00 54.38
Observations Prob > F R-square	148975 0.00 0.258	97457 0.00 .	48233 0.00 .	13737 0.00 .
Country fixed effects Sector fixed effects Loan type fixed effects Deal specific rating indicator	No Yes Yes Yes	No Yes Yes Yes	No Yes Yes Yes	No Yes Yes Yes
Intruments for spreads	No	Yes	Yes	Yes
Subset of samples		US only	Non-US	Non-US and EURIBOR

Standard errors and t statistics provided in the second and third rows below respective coefficients

4.3 Cross Border Effects and International Crowding Out

Thus far, the paper has not addressed any potential cross border impacts of government deficits. From the dataset, it is possible to identify the banks (and lenders) leading or participating in each loan transaction. The paper identifies two potential channels of cross border impact. For the rest of this section, unless otherwise mentioned, the paper will assume the US—the largest economy with a large budget deficit—as the "home" economy.

Regressions (10) and (11) have the same set up as regression (5), taking into account the impact of government deficits together with other macroeconomic and loan characteristics.

For (10), the same and includes only samples where a US bank is leading the transaction, while (11) includes samples where a foreign bank is leading the transaction.[17] Regression (12) employs only non-US transactions, but with US deficits included as an explanatory variable. The results are presented in Table 3.

[17] The identification of US banks and lenders is through a word search in the variable "Bookrunners" in the dataset. The identified US banks (and lenders) are Chase Manhattan, JP Morgan, Citibank, Wells Fargo, General Electric Capital, Goldman Sachs, Morgan Stanley, Bank of America, Merrill Lynch, Mellon Bank, Texas Commerce Bank, Citizens Financial, Farm Credit, Firth Third, Nations Bank, Comerica Bank, Bank One, Michigan National Corp, National City Bank, LaSalle National Bank, First Union, Wachovia, Bear Stearns, Lehman.

Table 3: Regressions of Spreads with Macro and Loan Characteristics (with Banking and Cross-Border Effects)

	10	11	12
Government net borrowing (% of GDP)	-21.65 0.63 -34.44	-28.29 1.48 -19.10	-2.92 0.33 -8.87
S&P Country Rating	-	-	7.19 0.36 19.74
Unemployment rate (%)	-9.76 1.05 -9.33	-27.47 2.48 -11.08	2.30 0.25 9.27
Government debt (% of GDP)	-0.36 0.13 -2.72	1.11 0.33 3.36	-0.09 0.03 -2.92
Inflation	-12.69 1.06 -11.96	-11.18 2.52 -4.44	0.69 0.26 2.69
US net borrowings (% of US GDP)			-10.12 0.35 -28.86
Loan type	-109.62 43.95 -2.49	-167.62 63.48 -2.64	-190.34 22.67 -8.40
Basel II (2005 onwards)	14.92 2.70 5.52	11.22 7.24 1.55	17.94 2.51 7.16
Basel III (2011 onwards)	63.96 6.32 10.13	83.30 15.63 5.33	107.58 2.71 39.73
Deal size (log)	94.59 3.18 29.73	232.03 12.38 18.74	91.74 2.44 37.66
Number of banks	-41.48 1.00 -41.61	-73.41 3.53 -20.81	-24.31 0.52 -46.65
Tenor	10.05 0.55 18.29	-2.72 1.31 -2.08	1.70 0.25 6.91
Observations Prob > F R-square	58481 0.00 -	25544 0.00 -	37310 0.00 -
Country fixed effects Sector fixed effects Presence of deal rating	No Yes Yes	No Yes Yes	No Yes Yes
Intruments	Tranches; GDP per capita (logs)	Tranches; GDP per capita (logs)	Tranches; GDP per capita (logs)
Subset of samples	US transactions with US lead banks	US transactions without US lead banks	Non US transactions

Standard errors and t statistics provided in the second and third rows below respective coefficients

5 Discussion and Implications

First, government expenditure has a positive impact on spreads, across the board in various regressions. On average and across all country samples, a one percentage point to GDP increase in government spending increases loans spreads by 8.5 basis points (based on regression 5 where full covariates are used). On the other hand, a 1 percentage point to GDP increase in government revenues lowers spreads by 9.7 basis point. Hence, deficit-financed fiscal expansion—whether higher expenditures and/or lower revenues—raises spreads. The coefficients of 8.5 and 9.7 suggest higher expenditures and lower revenues have a symmetric effect on spreads.[18] The other macroeconomic variables have relatively small coefficients and are not economically meaningful. Note that the coefficient on stock of government debt is small, and spreads are largely affected by "flow" rather than "stock" of government borrowings though the effects of overall debts could be seen through country ratings (see below). Business cycle effects are important in the US (regression 10 and 11) where higher unemployment is associated with lower spreads.

Second, higher spreads have a significant negative impact on loan sizes. Taking a rough approximation allows one to understand the magnitude. Again, taking US as an example to illustrate. A 1 percentage point of deficit spending is equivalent to USD195 billion approximately (using 2017 US nominal GDP). This increases loan spreads by around 22 basis points (see regression 10). With the spread coefficient of -0.00157 (see regression 7), this implies a 3.4-percent decline in the loan market. This is slightly on the low side as foreign banks are more sensitive to deficits (see regression 11), and they lead in around 10 percent of total loan value in the US. Nevertheless, a 3.4-percent decline in the USD2.77 trillion loan market for the US (see Figure 1) would imply a decline of around USD94 billion, or roughly one-half the size of the initial deficit spending, holding all other factors constant. There is partial crowding out of deficit fiscal spending through the loan market. Of course, this estimate does not take into account other policy actions.

Third, country risk ratings have a small but discernible impact in the pricing of loan spreads, with each downgrade notch raising spreads by around 4-5 basis points (regressions 4 and 5). A notch of downgrade impact on spreads is thus equivalent to around half a percentage point to GDP increase in deficit. This is an additional channel of crowding out if higher deficits and debts lead to downgrades.

Fourth, loan characteristics have important impact on spreads. A log point increase in loan size (that is, 10 times) raises spreads by around 100 basis points. Fixed rate loans also carry higher spreads. These are mitigated by more participating banks. Though this is not the focus of the research, it is important to note that Basel regulations can indeed explain the level shifts in spreads. From the regression, Basel II increased spreads by around 50 basis points, and this further increased to around 100 basis points with the introduction of Basel III. This may explain why the loan market has not grown much post crisis.

Cross border effects are important, and the paper specifically documents two. Firstly, based on the transactions in the US, it is clear that foreign lenders are more sensitive to higher government deficits (regression 11). Foreign lenders also charge more with larger loan size and are also more sensitive to the number of syndicating banks with each additional bank in

[18] The paper also carries out checks using subsamples of Japan, Europe and China, the other large markets. While coefficients differ for various subsamples, the general result that deficits increase spreads continues to hold.

the syndicate bringing down spreads by a larger extent (around 73 basis points). A similar "home" effect is observed also for Japanese transactions—US banks leading transactions in Japan are more sensitive to changes in Japan's deficits, loan size, and other participating banks in the syndicate. Beyond these two large markets, it is more difficult to test for such effects due to the small number of transactions.[19]

Secondly, US deficits have an impact on overall spreads, even for transactions outside US. A 1 percentage point to US GDP increase in deficit spending raises spreads by around 10 basis points (regression 12). This is robust to whether US banks are leading the transactions or not.

The paper does not propose a formal model as to why such international transmission takes place, but to hazard an explanation. The syndicated loan market is a large international market, and with a high presence of US-based international banks. Deficits spending are stimulative in nature. An increase in US deficit spending increases loan demand in US (controlled for all other factors), and raises spreads in the US, which then affects the rest of the market even when US banks are not leading transactions.

A 10-basis point increase in spreads in non-US transaction, coupled with a spread to loan size coefficient of -0.00083 (regression 8) implies a decline of around 0.8 percent of non-US loans, or around USD21 billion. Note that these are just average effects. As to how much loans are crowded out in each market will depend on two factors—how large is the syndicated loan market and how sensitive are loans to increase in spreads—and these would differ from country to country.[20]

Finally, while results are not provided in this paper, it is important to note that Japan's deficit has a similar impact of higher spreads outside of Japan but with a smaller magnitude on average (and especially small with samples that include participation of US banks). These observations are generally consistent with large country effects—that is, large economy deficits can increase financing cost beyond itself.

5.1 Policy Implications

The results discussed above have some policy implications. Typically, deficit spending makes it necessary for more Treasury bills to be issued, thereby driving up yields after accounting for various other factors (as noted by earlier researchers). This raises final borrowing cost for firms in the economy as loan spreads are added to reference rates. In the decade post crisis, there was significant use of QE by various central banks. This involved the purchase of government securities that indirectly financed deficit spending. Even as central banks held down yields, they were less able to affect the price of banking credit, which ultimately had to respond to market demand for loans, risks and other factors. The fact that deficit-financed fiscal expansion (and less so total government debts) is found to drive up spreads hints that it

[19] The paper does not study the effects of European deficits and banking channel effects. While Europe has many banks that are active in the syndicated loan market, it is unclear if they should be treated as a bloc especially in the context of the study of specific country deficits' impact on lending spreads.

[20] The paper tests for effects of US deficits on specific developing economies. There is some very preliminary evidence that US deficits have a large upward impact on spreads in Indonesia (coefficient -53), Korea (-13), Brazil (-22), but the full regressions are not reported in the paper because the numbers of transactions are small in each of these specific markets.

is the credit demand channel that is at work.[21] Policy makers will need to pay attention to loan spreads, not just headline yields.

For developed economies, the implication here is that fiscal expansion works, but will be partially crowded out by higher spreads. Fiscal consolidation is also likely to be less contractionary for the economy, given that this can be accompanied and partially offset by lower yields and credit spreads. There is some evidence that US deficits will raise credit spreads and impact various economies including developing ones, notwithstanding the smaller number of transactions. Developing economies will have to deal with the crowding out impact of US fiscal position and factor this risk into their macroeconomic management accordingly.

5.2 Limitations of Study

There are some limitations to this study. Its empirical approach is reduced form in nature. While it is likely that the higher loan spread is due to stronger demand associated with fiscal expansions, the exact channels to which fiscal deficits transmit to private credit spreads have not been pinned down. A second limitation of the study is that the syndicated loan market, while large, is not the only source of debt finance for companies—many would have access to the bond markets, through private lending, or through other structured finance products. Large companies in particular would be able to access a wider range of finance, and the impact of higher credit spreads through the banking sector could be mitigated.

6 Conclusion

The impact of US government deficits on Treasury yields is well studied, but there is relatively little study on how deficits affect loans through the banking channels. The divergence between central bank policy rates, LIBOR, Treasury yields versus loan spreads over a prolonged period post crisis (including non-US loans) suggests that it is important to study possible crowding channels through the banking sector.

Deficit-financed fiscal expansion are stimulative (after accounting for business cycles), and this can show up as higher loan demand and higher loan spreads. This paper tests for this over many regression settings and provides evidence of partial crowding out of fiscal expansion. Taking US as an example, the partial crowding out is estimated at around one-half the size of deficit spending. This is sizeable, but on the whole shows that fiscal policy remains effective as crowding out is only partial. Moreover, this discussion admittedly does not take into account of possible countervailing actions by central banks (such as lowering rates during economic downturns).

The paper also provides some evidence of international crowding out. A 1 percentage point to US GDP increase in US deficit is estimated to increase spreads by around 10 basis points, on average, and a reduction of USD21 billion of non-US loans.

[21] A subtle point to note that during QE, the banking sector also amassed large banking reserves. In principle, this could have been converted to supply credit to the economy and prevented the rise in loan spreads. However, note that the average tenor is 4.7 years in the syndicated loan market. There was uncertainty around QE policies (specifically, how and when these would be unwound), and banks were also motivated to hold more reserves as buffer post crisis. This could explain why banking sector credit did not expand as much.

References

Acharya, V., Eisert, T., Eufinger, C., & Hirsch, C. (2018). Real Effects of the Sovereign Debt Crisis in Europe: Evidence from Syndicated Loans. *The Review of Financial Studies*, 2855-2896.

Aisen, A., & Hauner, D. (2008). Budget Deficits and Interest Rates: A Fresh Perspective. *IMF Working Paper*.

Altunbas, Y., Alper, K., & Marquez-Ibanez, D. (2009). Large Debt Financing Syndicated Loans Versus Corporate Bonds. *European Central Bank Working Paper Series*.

Bank for International Settlements. (2011). Basel Committee on Banking Supervision Consultative Document: Revisions to Standardised Approach for Credit Risk.

Barro, R. J. (1989). The Ricardian Approach to Budget Deficits. *Journal of Economic Perspectives*, 37-54.

Barth, J., Iden, G., & Russek, F. (1985). Federal Borrowing and Short Term Interest Rates: Comment. *Southern Economic Journal*, 554-559.

Blanchard, O. (2019). Public Debt and Low Interest Rates. *American Economic Review*, 1197-1229.

Blanchard, O. J., & Leigh, D. (2013). Growth Forecast Errors and Fiscal Multiplier. *American Economic Review: Papers and Proceedings*, 117-120.

Dennis, S. A., & Mullineaux, D. J. (2000). Synidicated Loans. *Journal of Financial Intermediation*, 404-426.

Engen, E. M., & Hubbard, R. (2004). Federal Government Debt and Interest Rates. *NBER Macroeconomic Annual* .

Feldstein, M. (2016). Dealing with Long-Term Deficits. *American Economic Review: Papers & Proceedings*, 35-38.

Friedman, B. M. (1978). Crowding Out or Crowding In? Economic Consequences of Financing Government Deficits. *Brookings Papers on Economic Activity*, 593-641.

Fuchs-Schuendeln, N., & Hassan, T. A. (2016). Natural Experiments in Macroeconomics. *Handbook of Macroeconomics*.

Gale, W. G., & Orszag, P. R. (2004). Budget Deficits, National Saving, and Interest Rates. *Brookings Papers on Economic Activity*.

Goldfeld, S. M., Kareken, J. H., & Hamburger, M. (1978). [Crowding Out or Crowding In? Economic Consequences of Financing Government Deficits] Comments and Discussion. *Brookings Papers on Economic Activity*, 642-654.

Hoelscher, G. P. (1983). Federal Borrowing and Short Term Interest Rate. *Southern Economic Journal*, 319-333.

Ivashina, V., & Scharfstein, D. (2010). Loan Syndication and Credit Cycle. *American Economic Association: Papers and Proceeding*, 57-61.

Khan, Z. (1988). Government Budget Deficits and Interest Rates: The Evidence since 1971, Using Alternative Deficit Measures. *Southern Economic Journal*, 725-731.

Laubach, T. (2004). The Effects of Budget Deficits on Interest Rates: A Review of Empirical Results. *Federal Reserve Board*.

Lim, J., Minton, B. A., & Weusbach, M. S. (2014). Sydicated Loan Spreads and the Composition of the Syndicate. *Journal of Financial Economics*, 45-69.

Ma, T. (2016). Basel III and the Future of Project Finance Funding. *Michigan Business & Entrepreneurial Law Review*.

Mankiw, G. N., & Weinzierl, M. (2011). An Exploration of Optimal Stabilization Policy. *The Brookings Institution*.

Simons, K. (1993). Why do Banks Syndicate Loans? *New England Economic Review*.

Thia, J. (2019). Bank Lending - What Has Changed Post Crisis? *Journal of Economics and Finance*, 256-272.

Thomson Reuters. (2018). Global Syndicated Loans Review.

Wachtel, P., & Young, J. (1987). Deficit Announcement and Interest Rates. *American Economic Review*, 1007-1012.

Yellen, J. L. (1989). Symposium on the Budget Deficit. *Journal of Economic Perspectives*, 17-21.