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Stock Market Reactions to India's 2016 Demonetization: Implications for Tax Evasion, Corruption, and Financial Constraints

Abstract

On November 8, 2016, the Indian government made a surprise announcement that certain currency notes (representing 86% of the currency then in circulation) would no longer be legal tender (although they could be deposited in banks over a limited period). The stated reason for this sudden "demonetization" was to combat tax evasion and corruption associated with "unaccounted-for" cash. We compute abnormal returns for firms on the Indian stock market around this event, and compare patterns of abnormal returns for different subsamples of firms defined by industry, ownership structure, and other characteristics. There is little evidence that sectors thought to be associated with greater tax evasion or corruption experienced significantly different returns. However, we find substantial positive returns for banks and for state owned enterprises (SOEs), implying market expectations that are puzzling in some respects, especially as the initial reactions do not show any evidence of reversal in the five months following the event. The bank results appear to indicate a market expectation of a persistent increase in financial depth. We also find a pattern of higher returns for industries that are characterized by a greater dependence on external finance, possibly suggesting an expectation of an easing of financial constraints. The returns for SOEs may be due to possible indirect effects of the announcement on perceptions of future corruption among these firms.

JEL-Codes: E420, H260.

Keywords: corruption, tax evasion, demonetization, financial constraints, India.

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1) Introduction

Corruption and tax evasion are central themes in the study of development, having occupied the attention of countless scholarly articles, news stories, development agency mandates and legislative agendas.[1] Tax evasion is thought to be an important constraint on increasing the fiscal capacity of developing countries – for instance, developing countries typically collect about 10% to 20% of GDP in taxes, compared to about 40% of GDP for developed countries (e.g. Besley and Persson, 2014). Corruption has been shown to have substantial effects on economic growth and the level of income, to distort the composition of government expenditures (as surveyed e.g. in Dreher and Herzfeld, 2005), and to affect inbound foreign investment (e.g. Wei, 2000; Dharmapala and Hines, 2009). However, the empirical analysis of the effects of tax evasion and corruption is hampered by the difficulty of observing these phenomena and the interactions among various institutional characteristics.

On November 8, 2016, what was billed as a new weapon in the anti-corruption arsenal was unveiled. The Prime Minister of India, Narendra Modi, gave a surprise address to the nation to announce that from midnight the 500 and 1000 Indian Rupee (INR) notes would no longer be legal tender.[2] He said this was being done to address concerns with "unaccounted for" cash used for corrupt payments and tax evasion. The scale of this announcement is quite staggering – these notes represented roughly 86% of the value of currency in circulation in India, an economy in which it is estimated that over 90% of transactions are conducted in cash.[3] Holders of these notes were allowed to deposit them at banks and post offices until December 30, 2016, subject to certain restrictions. For instance, they faced substantial penalties unless they were able to explain

[1] On corruption, see for instance Shleifer and Vishny (1993), Mauro (1995), Bardhan (1997), Basu, Basu and Cordella (2016), Tanzi (1998) and Sah (2007), among many others. On tax evasion, see the various articles collected in Dharmapala (2017).

[2] See Ministry of Finance, Department of Economic Affairs, New Delhi, Notification No. 2652, 8 November 2016, available at: http://www.finmin.nic.in/172521.pdf [hereinafter Notification 2016]. This was issued under Section 26(2) of the Reserve Bank of India Act 1934, which enables the Central Government, on recommendation of the Central Board of Directors of the Reserve Bank of India, to declare any series of notes to no longer be legal tender.

[3] See Reserve Bank of India, Annual Report, March 31, 2016 (Part VIII – Currency Management), available at: https://www.rbi.org.in/scripts/AnnualReportPublications.aspx?Id=1181, and Price Waterhouse Coopers, *Disrupting cash: Accelerating electronic payments in India*, available at: https://www.pwc.in/assets/pdfs/publications/2015/disrupting-cash-accelerating-electronic-payments-in-india.pdf. Unaccounted-for cash is outside the formal financial system. In the Indian media, it is often referred to as "black" money.

where the money came from and whether it was already taxed; however, there was a *de minimis* exemption from these requirements for smaller deposits.

The announcement of what has come to be known as "demonetization" was very much a surprise, and provides a rare opportunity to not only test the effects of this particular initiative but also to derive more general insights into the phenomena of corruption and tax evasion. In this paper we conduct an event study around the November 8, 2016 announcement, analyzing stock market reactions for different subsamples of Indian firms defined by industry, ownership structure and other characteristics. Our key findings are that the industries thought to be most affected by corruption and tax evasion did not experience substantially different market reactions, and that banks and state-owned enterprises (SOEs) were positively affected by the announcement. We explore some of the implications of these findings below.

We begin with a simple illustrative model of transactions in the real estate sector, where it is thought that unaccounted-for cash is widely used in order to evade a tax known as "stamp duty."[4] We show that under certain assumptions the magnitude of the decline in the value of real estate firms around this announcement allows us to infer the extent of tax evasion prior to demonetization. We then use daily stock price data from the Prowess database to compute cumulative abnormal returns (CARs) around the demonetization announcement for real estate firms and for various other subgroups of firms (defined using industry and ownership categorizations provided by Prowess and various other sources).

Of course, the stock market's reactions are just the earliest assessments of demonetization's likely effects. The predictions of stock market investors may of course turn out ultimately to have been mistaken. The unprecedented scale of India's demonetization also makes it difficult to predict its effects. The actual effects will become clearer as time progresses and more data becomes available. As of the time of writing, however, these effects remain highly uncertain, and the initial stock market reactions thus remain valuable as a guide. In particular, stock market reactions represent useful information from parties who have their proverbial "ear to the ground" and have

[4] See e.g. Dhaval Kulkarni "Demonetizatiopn hits real estate hard", *DNA India*, December 2, 2016, available at: http://www.dnaindia.com/mumbai/report-demonetization-hits-real-estate-hard-2278879.

strong financial incentives to predict these effects correctly. It is sometimes said that journalism is the first rough draft of history, and the stock market reactions analyzed in this paper can analogously be understood as a first draft of the story of the impact of this policy, and its wider implications for understanding corruption and tax evasion.

It should be emphasized that our aim is not to measure the overall reaction of the Indian stock market – which could potentially be affected by other events in the same time period – but rather the differential reactions for different subgroups of firms (relative to the overall market reaction).[5] A particularly noteworthy potential confounding event is the US Presidential election of November 8, 2016, which took place on the same day and also represented a dramatic surprise. While the US election may have affected the general level of the Indian market, there does not seem to be any reason to think that it would have differentially affected the sectors that we analyze. For example, we do not find strong effects for sectors – such as information technology – that have particularly close ties to the US, and are not aware of any evidence that specific sectors in non-US markets were differentially affected by the US election.

We find a statistically significant market reaction of between -2% and -4% (depending on the specification) for real estate firms. While there are a number of important caveats, it appears that this relatively modest magnitude is consistent with either a relatively small amount of tax evasion prior to demonetization, or with an expectation that demonetization would have little impact on the prevalence of tax evasion. We also find no detectable relationship between the CARs experienced by firms around the demonetization announcement and an index of sector-level perceptions of the prevalence of bribery (constructed by Transparency International (2011) based on global survey data, as described in Section 4 below). These findings suggest that the market

[5] Kumar (2017) studies the impact of the demonetization announcement on analysts' forecasts of Indian firms' earnings per share, finding no substantial change in these estimates after the announcement. However, the focus of Kumar (2017) is not on differences in market reactions across sectors. Jain, Shekhar and Deshpande (2017) analyze market reactions, but only for the hospitality industry. In contrast, our approach shares some similarities with recent studies of other "surprise" events elsewhere in the world. Wagner, Zeckhauser and Ziegler (2017) analyze the stock market reactions around the 2016 US Presidential election for subgroups of US firms defined by industry and other characteristics. Ramaiah, Pham and Moosa (2017) analyze market reactions for subsets of UK firms around the June 2016 ("Brexit") referendum vote to leave the European Union. Davies and Studnicka (2017) analyze market reactions for UK firms to the same event and to subsequent relevant events. They find that UK firms with stronger supply chain linkages in Europe experienced more negative market reactions.

expected the effects of demonetization on corruption and tax evasion across the economy to be modest at best.

Indeed, most identifiable subgroups of Indian firms did not experience substantially different reactions in relation to the overall market. The most striking results relate to the banking sector and to SOEs. Banks experienced on average a positive and statistically significant abnormal return of about 3% to 7% (depending on the specification). This market expectation is somewhat puzzling. At a conceptual level, it is unclear why demonetization (followed by remonetization) would by itself affect households' demand for cash and cash equivalents. More specifically, the observed reaction requires that the market believed that demonetization would lead to a substantial and persistent shift in the form of savings, from unaccounted-for cash to bank deposits (i.e. an increase in "financial depth").[6] Of course, the announcement was expected to lead (as it in fact did) to a massive inflow of new deposits at banks. However, to explain a substantial increase in the value of banks' equity, it is necessary that these deposits were expected not to be withdrawn (or otherwise used for consumption, for instance through electronic payments) in the short-to-medium term; this would enable banks to increase lending or other profitable activities.[7]

Assessing whether this apparent market expectation was reasonable is quite complicated. The government imposed restrictions on withdrawals until March 13, 2017. From the available data, it does not seem that there was any noticeable increase in withdrawals after the restrictions were lifted. Moreover, for a variety of reasons - legal, practical and otherwise (discussed below in Section 5) - we think it unlikely that individuals would have withdrawn much of what they deposited. Ultimately, it remains an open question as to whether most of the new deposits will end up being withdrawn in the short-to-medium term, but early evidence suggests withdrawals are quite limited. Thus, stock market reactions remain a valuable source of information on perceived longer-term effects.

[6] The concept of financial depth measures the size of the formal financial sector relative to the size of the economy – see e.g. Beck, Demirguc-Kunt and Levine (2000).

[7] On November 30, 2016, the Reserve Bank of India (RBI) changed the incremental reserve ratio for banks to prevent an increase in lending out of the new deposits. However, this measure was short-lived (as it was lifted on December 10, 2016) and is thus unlikely to have had much impact.

The market expectation that banks would increase lending is consistent with another of our results. We use a sector-level measure of the dependence of an industry on external finance, constructed by Rajan and Zingales (1998) and updated by Kroszner, Laeven and Klingebiehl (2007), and find that the higher an industry's dependence on external finance the larger the CARs it experienced around the demonetization announcement. This is consistent with the idea of banks having more investible capital (due to new deposits), which is then invested in firms in industries most likely to seek external finance.

We also find that SOEs experienced a positive and significant response of about 2% to 6% (depending on the specification). This result holds both for SOE banks (in common with non-SOE banks) and for nonbank SOEs. The market expectation of an increased value for SOEs is in some respects even more puzzling than that for banks. Here, too, we do not necessarily have a complete explanation, but there is some evidence consistent with a story centered on expectations of indirect effects on corruption. When the government decided to act in an unprecedented manner that carried great political and economic risk, it may have sent a (quite costly) signal about its seriousness in curtailing corruption. This may involve in particular a crackdown on corruption at SOEs – either because they are especially prone to corruption, or because they are easier for politicians to influence.

Another related interpretation is that state ownership might serve as a proxy for corruption risk. Industries are ranked on corruption risk (e.g. Transparency International (2011)) in part due to their interaction with the government (or the degree of regulation they face); state ownership involves a particularly high degree of interaction with the government. Moreover, it is possible that the extent to which SOEs are susceptible to corruption, relative to non-SOEs, is much greater than the differences in corruption *among* non-SOEs that the Transparency International and other indices seek to capture. This can potentially explain a large effect for SOEs, even though there is little evidence that market reactions to demonetization were related to the prevalence of corruption in different industries.

Both the bank and SOE findings are puzzling to some extent. Moreover, when we construct a portfolio consisting of all of the banks in our sample, there is no evidence of a

reversal of the positive abnormal returns that occurred around demonetization during the five months following the event (through the end of our dataset on March 31, 2017). The same is true of a portfolio consisting of all of the SOEs in our sample. Thus, there is no evidence that stock market investors reevaluated their initial reactions over this time period.

While there are many important caveats (as discussed above), we think that these results are intriguing and worthy of further exploration in future research. As more data becomes available, it will be possible to analyze more directly many of the consequences of demonetization. However, the initial stock market reactions are a valuable source of guidance on expectations about longer-term effects.

The paper proceeds as follows. Section 2 provides the background to the November 8, 2016 demonetization. Section 3 discusses the consequences of demonetization and how stock market reactions can provide valuable insights. Section 4 describes our dataset and presents our empirical strategy. Section 5 discusses the results and their implications. Section 6 concludes.

2) Background

2.1) Announcements

On November 8, 2016 at about 8:00pm Indian Standard Time, Prime Minister Narendra Modi of India gave an unscheduled television address in which he informed the nation that from midnight the INR 500 (~USD 8) and 1000 (~USD 16) notes would no longer be legal tender. This represented roughly 86% of the currency in circulation in India, an economy that is estimated to conduct over 90% of its transactions in cash.[8] According to the Prime Minister, this extraordinary step was being taken due to concerns about corruption, unaccounted-for cash, and counterfeiting that might aid terrorist

[8] *See* Reserve Bank of India, Annual Report, March 31, 2016 (Part VIII – Currency Management), available at: https://www.rbi.org.in/scripts/AnnualReportPublications.aspx?Id=1181. See also Harish Damodaran, "Are Banks equipped to replace 2,300 crore pieces of Rs. 500 and Rs. 1000 notes?", *Indian Express*, November 9, 2016. Available at: http://indianexpress.com/article/opinion/web-edits/rs-500-rs-1000-notes-are-banks-equipped-to-replace-1874-crore-pieces-of-notes-4364746/.
On the size of the cash economy see Price Waterhouse Coopers, *Disrupting cash: Accelerating electronic payments in India*, available at: https://www.pwc.in/assets/pdfs/publications/2015/disrupting-cash-accelerating-electronic-payments-in-india.pdf.

groups.[9] These notes could still be deposited at banks and post offices or exchanged for other notes (including the soon-to-be-released new INR 500 notes and INR 2000 notes) until December 30, 2016. Thereafter, the old INR 500 and 1000 notes would be worthless. Note that the provision of new currency notes makes the demonetization in reality a "re-monetization", but because much of the commentary refers to the events of November 8, 2016 as "demonetization" we use that terminology.

This was soon followed by further announcements from India's central bank – the Reserve Bank of India (RBI) – and others about how the process would be regulated. The old notes would not be recognized as legal tender starting from 12:00am November 9, 2016,[10] but credit card, debit card and other e-payment systems were not limited (Notification 2016). Restrictions were placed on both bank deposits and withdrawals. If the amount deposited was below INR 250,000 (~USD $4,000), the depositor would not be required to explain where the funds were from (and whether tax was paid on them).[11] However, if the depositor had not yet complied with "Know Your Customer" (KYC) norms then the amount deposited could not exceed INR 50,000 (Notification 2016). If the deposit amount was above INR 250,000 and no acceptable explanation about prior tax payments was provided the depositor would have to pay the tax (~30% of the deposit amount) and an additional fine/payment.[12] Although details of the taxes and penalties to

[9] Notification (2016); Abhinav Bhatt, "PM Modi Announces Notes Ban In Anti-Corruption Move, Millions Face Cash Crunch" NDTV India, November 8, 2016. Available at: http://www.ndtv.com/india-news/pm-modi-speaks-to-nation-tonight-at-8-pm-1622948 [*hereinafter* Modi address 2016].

[10] See Modi address 2016 and Press Releases, Ministry of Finance, Department of Economic Affairs, New Delhi, November 8, 2016 and December 1, 2016. Some exceptions were made for emergencies (e.g., paying hospital bills).

[11] This arises by operation of Rule 114B, Income Tax Rules 1962 which lists transactions for which a person must quote his or her permanent account number (PAN) – for example, deposits exceeding INR 250,000 in aggregate in one bank/post office for any one person in the deposit period – November 9, 2016 to December 30, 2016 (or INR 50,000 in a day in the same period) – and Rule 114E, Income Tax Rules 1962 which requires banks and post offices to report cash deposits exceeding INR 250,000 in aggregate during the deposit period for any non-current accounts held by one person and INR 1,250,000 in aggregate for any current accounts held by one person. These changes to the Income Tax Rules were published on November 15, 2016. See Central Board of Direct Taxes, Notification No. 104/2016 Income Tax, November 15, 2016.

[12] The fine amount varied in the days after November 8, but it was roughly between 20% to 100% in addition to the taxes, depending on the circumstances - see Amended Sections 115BBE, 119C to 119R, and 271AAB(1A) of the Indian Income Tax Act 1962 (Taxation Laws (Second Amendment) Act 2016, No. 48 of 2016, available at http://www.egazette.nic.in. The lowest amount that might be paid was if the depositor availed of the "Taxation and Investment Regime for Pradhan Mantri Garib Kalyan Yojana" (sections 119C to 119R noted above) that required the depositor to pay taxes of 30% on the undisclosed income that is being deposited along with a "cess" of 33% of the tax paid (i.e., 10% of the deposit – 33% of 30%) and an

be paid for unexplained deposited funds were not released on November 8, 2016, we think it reasonable for the market to expect that there would be such taxes and penalties based on prior amnesty schemes.[13]

There were also limits on the amount that could be withdrawn. Initially, an individual could only withdraw INR 4,000 per day from a bank account with a weekly limit of INR 20,000 (Notification 2016), which was raised to INR 24,000 a week, then INR 50,000 a week and then lifted altogether on March 13, 2017.[14] There were also limits on withdrawals from ATMs, which started at INR 2,000 per day, but were gradually raised and eventually eliminated on February 1, 2017.[15]

Unsurprisingly, there was an intense rush to the banks as soon as they opened. People were in queues for hours to both deposit and withdraw cash.[16] Given the

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additional penalty of 10% - a total of 50%. However, the depositor also had to contribute 25% of the deposit amount into a specific deposit scheme for 4 years with no interest. The money in the scheme was to be used for a variety of state projects. The next highest amount would be under Section 115BBE where someone declares undisclosed income but does not put it in the specific deposit scheme. Here the individual pays 30% tax and what amounts to an additional 53.25% more (totaling 83.25%). Finally, the highest amount (under Section 271AAB(1A)) was if the government detected the undisclosed income (i.e., the individual did not self report) in which case the tax of 30% would be accompanied by either a penalty of about 77% or 107% depending on the circumstances. For instance, a person depositing INR 1,000,000 without a good explanation on tax payments might pay INR 300,000 as taxes owed and another INR 530,000 approximately as penalty leaving a net deposit amount of about INR 170,000 (this example assumes the depositor fits within amended section 115BBE noted above).

[13] The more recent "amnesty" schemes for "black" money involved depositors paying the taxes and some additional fee or penalty. For example, The Income Declaration Scheme, 2016 (from June 1, 2016 to Sept. 30, 2016) would allow people to declare income, pay taxes of 30% on it and additional penalties of 15% (a total of 45% of the income declared). See Circular No. 16 of 2016, F.No.370142/8/2016-TPL, Government of India, Department of Revenue, Central Board of Direct Taxes (TPL Division), May 20, 2016. Also see http://www.incometaxindia.gov.in/Pages/income-declaration-scheme.aspx, and http://www.incometaxindia.gov.in/Pages/ids-2016.aspx.

[14] *See* Press Release, Ministry of Finance, Department of Economic Affairs, New Delhi, November 13, 2016; "RBI lifts all cash withdrawal limits from today", *Indian Express*, March 13, 2017. Available at: http://indianexpress.com/article/business/banking-and-finance/rbi-lifts-all-cash-withdrawal-limits-from-today-march-13-demonetisation-4567890/.

[15] *See* "RBI: No limits on cash withdrawals through ATMs from February 1", *Indian Express*, January 30, 2017. Available at: http://indianexpress.com/article/business/banking-and-finance/rbi-atm-withdrawal-limit-february-demonetisation-note-ban-4499156/. There were also limits on the amount of notes that could be exchanged for new notes – starting at INR 4,000 per person then INR 4,500 per person and then back down to INR 2,000 per person with all exchanges being stopped as of November 25, 2016. See Press Release, Ministry of Finance, Department of Economic Affairs, New Delhi, November 17. 2016 and Sunny Verma, "All note exchange stopped from today, PM Modi goes back on promise of hike after November 24", *Indian Express*, November 25, 2016. Available at: http://indianexpress.com/article/india/india-news-india/pm-modi-said-exchange-limit-to-be-hiked-after-november-24-exchange-stopped-4393985/.

[16] "Queues get longer at banks, ATMs on weekend", *The Hindu*, 12 November 2016. Available at: http://www.thehindu.com/news/national/Queues-get-longer-at-banks-ATMs-on-weekend/article16443670.ece, Geeta Anand, "Indians Rush Frantically to Launder Their 'Black Money'", *New York Times*, November 20, 2016. Available at:

importance of cash transactions in India's economy, it was essential for even salaried individuals (who would have no difficulty showing they paid tax) to have cash on hand for daily expenses. The queues were a daily occurrence for weeks and began to diminish only as more cash became available and as withdrawal limits were eased.[17]

2.2) Context

This is the third time in the last 70 years that India has demonetized some part of its currency. In 1946, the INR 1000 and 10,000 notes were demonetized, and in 1978 the INR 1000, 5,000 and 10,000 notes were demonetized.[18] The motivation was similar – to try to address concerns with unaccounted-for cash and its accompanying ills.[19] Demonetization has also occurred in other parts of the world and is typically motivated by similar concerns, as well as by inflation and by changes in currency (e.g., upon the introduction of the Euro).[20] However, the November 8, 2016 demonetization differed markedly from earlier episodes in India and elsewhere in its vast scale and in the surprise nature of the announcement. Whereas earlier demonetizations in India and elsewhere usually affected only the highest value notes in the economy,[21] the November 8, 2016

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https://www.nytimes.com/2016/11/21/world/asia/modi-rupees-india-corruption.html, Mayuresh Ganapatye, "Demonetisation: Month later, long queues still outside banks and ATMs in Mumbai", *India Today*, December 8, 2016. Available at: http://indiatoday.intoday.in/story/demonetisation-long-queues-banks-atms-mumbai/1/830100.html.

[17] "28 days of demonetisation: No let-up in rush at banks, ATMs", *Economic Times*, December 6, 2016. Available at: http://economictimes.indiatimes.com/industry/banking/finance/banking/28-days-of-demonetisation-no-let-up-in-rush-at-banks-atms/articleshow/55838985.cms, George Mathew and Khushboo Narayan, "As ATMs dry up, bankers say normalcy will return soon", *Indian Express*, April 12, 2017. Available at: http://indianexpress.com/article/business/banking-and-finance/as-atms-dry-up-bankers-say-normalcy-will-return-soon-4609546/.

[18] Vikram Doctor, "The cycles of demonetisation: A looks back at two similar experiments in 1946 and 1978", *Economic Times Blog*, November 12, 2016. Available at: http://blogs.economictimes.indiatimes.com/onmyplate/the-cycles-of-demonetisation-a-looks-back-at-two-similar-experiments-in-1946-and-1978/.

[19] Doctor (2016), Gopika Gopakumar and Vishwanath Nair, "Rs 500, Rs 1000 notes may be back, if history is a guide", *Live Mint*, November 9, 2016.

[20] In the US demonetization is currently prohibited (Coinage Act 1965), but in the past there has been demonetization of silver – Friedman (1990), Weinstein (1967). In the Eurozone see Council Regulation (EC) No. 975/98 (1998) of 3 May 1998, in the UK see the Coinage Age 1971 (c. 24) and in Venezuela see "Venezuela's lunatic experiment in demonetization", *The Economist*, December 15, 2016. Available at: http://www.economist.com/news/finance-and-economics/21711937-nicol-s-maduros-latest-act-economic-sabotage-cancelling-100-bol-var.

[21] National Institute of Public Finance and Policy, *Aspects of Black Money* (1985), available at: http://www.nipfp.org.in/book/927/, Ministry of Finance, Department of Revenue, *Measures to Tackle Black Money in India and Abroad* (2012a), available at: http://www.dor.gov.in/sites/upload_files/revenue/files/Measures_Tackle_BlackMoney.pdf, Ministry of Finance, Department of Revenue, *White Paper on Black Money* (2012b), available at:

demonetization targeted fairly moderate-value notes that made up the vast amount of currency in circulation (86% is a frequently used estimate). Combined with the surprise nature of the announcement - according to some reports, only 10 people in the entire country of 1.25 billion people were aware of plans to demonetize[22] - this created the potential for large scale economic disruption.

Both the scale and secrecy of this demonetization appear to be in response to increased concerns over corruption and unaccounted-for cash. Most global rankings place India in the middle of countries in terms of perceived corruption risks, while many domestic studies in India suggest high levels of corruption and tax evasion.[23] Further, there have been numerous reports on unaccounted-for cash, and steps taken by the Government and the Courts to address it that have met with only limited success.[24]

Prior to the November 8, 2016 announcement, the Government of India had instituted various "amnesties" for black money and had been engaged in attempting to get

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http://www.finmin.nic.in/reports/whitepaper_blackmoney2012.pdf. Indeed, targeting high value notes is something that has recently been discussed in the US (Rogoff, 2016).

[22] Arup Roychoudhury, "Demonetisation: In the works for 6 months, 10 people in the loop, including Raghuram Rajan", Business Standard India, November 10, 2016, available at: http://www.business-standard.com/article/economy-policy/demonetisation-in-the-works-for-6-months-10-people-in-the-loop-including-raghuram-rajan-116111000009_1.html. It is noteworthy that banks were aware of the new INR 2000 note, but not that it was part of a plan to demonetize. The secrecy was apparently considered necessary in order to ensure that people who had large amounts of "black" money or corruption rents would not have time to funnel the money out of India and avoid the effects of demonetization. In other words, this demonetization was presented as attempting to not only effect matters going forward but also to penalize those who had already accumulated large amounts of cash in questionable or illicit ways. One measure of the secrecy was a report that the Cabinet was unaware of the plan for demonetization until about one hour before the Prime Minister addressed the nation. See Roychoudhury, *ibid*.

[23] See Corruption Perceptions Index, Transparency International (2016) ranking India as 79th out of 176 countries, available at: https://www.transparency.org/news/feature/corruption_perceptions_index_2016. In addition, it has been noted that corruption is likely holding India's growth down (Debroy and Bhandari, 2011; KPMG, *Survey on Bribery and Corruption – Impact on Economy and Business Environment*). See also Nirvikar Singh, "The Trillion Dollar Question", *Financial Express*, December 19, 2010, available at: http://www.financialexpress.com/archive/the-trilliondollar-question/726482/0/, "India's Bureaucracy Ranked Worst in Asia", *BBC News*, January 12, 2012, available at: http://www.bbc.com/news/world-asia-india-16523672.

[24] See the citations in fn. 19. The Supreme Court of India also ordered the formation of a Special Investigative Team to look into "black" money and to try to recover it. See *Ram Jethmalani & Ors v. Union of India & Ors*, 2011 8 SCC 1, http://courtnic.nic.in/supremecourt/temp/17620093472011p.txt. The Government of India also has also attempted to get information from Swiss Banking authorities on accounts held by Indians that may be a repository of "black" money. See Vicky Nanjappa, "Swiss black money can take India to the top", Rediff.com, March 31, 2009, available at: http://election.rediff.com/interview/2009/mar/31/inter-swiss-black-money-can-take-india-to-the-top.htm, but see Ministry of Finance (2012b) .Concerns with "black" money pre-date India's Independence in 1947. See C.W. Ayers, S.P. Chambers and J.B. Vachha, *Income Tax Enquiry Report, 1936*, Submitted to the Government of India as a Result of the Investigation of the Indian Income Tax System (1936).

more people to open bank accounts.[25] Although some of these measures had met with some success, many others seemed to have languished. Moreover, there appeared to be general agreement that for India to continue to grow economically something needed to be done to rein in corruption and curtail the spread of unaccounted-for cash, amongst other things (e.g. Debroy and Bhandari, 2011, Singh, 2010, Colvin, 2011).

Against this background, the plans for demonetization appear to have been in process for some time. The new INR 2000 note was announced months before November 2016.[26] Further, prior to demonetization there had been efforts made by the government to enhance the number of people with identity cards (the "Aadhar" scheme), to open new bank accounts for people (the "Jan Dhan" initiative), to have more people with a personal account number ("PAN" card), and to enable more mobile banking.[27] All of these steps – although not necessarily motivated by a plan to demonetize – helped to lay the groundwork for demonetization and its potential impact on India. It is also noteworthy that the PAN card when combined with the Prevention of Money Laundering Act 2002 (PMLA) means that any person withdrawing cash above certain amounts from a bank account can be tracked under PMLA with the use of the PAN card (which that person must have in order to obtain a bank account). Of course, whether this tracking will happen remains to be seen, but the scaffolding appears to be in place. This tracking infrastructure can potentially explain why it may be difficult to use cash that has been deposited in the banking system subsequently for corrupt activities.[28]

2.3) Initial Responses

[25] See Ministry of Finance (2012a, 2012b), Ram Jethmalani & Ors. V. Union of India (2011).
[26] Marya Shakil, "Don't Panic, Printing of New Currency Notes Began Months Ago", *CNN-News18*, available at: http://www.news18.com/news/india/dont-panic-the-printing-of-new-currency-notes-began-months-ago-1309747.html.
[27] Aadhar Act 2016. Aadhar is the world's largest biometric ID system with over 1 billion people being a part of it (it is a 12 digit unique-identity number issued to all Indian residents). See *Public Data Portal State Wise Saturation*, https://uidai.gov.in/. The "Jan Dhan" initiative (formally "Pradhan Mantri Jan-Dhan Yojana") is the Government of India's program for enhancing availability of Financial services to the population in an affordable manner – thus far (April 2017) about 280 million bank accounts have been opened under the initiative since it started in August 2014, though a number of the accounts have a zero balance (about 24% on the latest figures from April 2017). See www.pmjdy.gov.in. There are plans to use this to roll out more mobile banking initiatives. The PAN card is a unique 10-character alpha-numeric identifier used for tax purposes in India under the Indian Income Tax Act 1961.
[28] We do not discuss how parties in India generate and then launder "black" money. For more discussion, see the Ministry of Finance publications cited above and Jindal (2016).

Following the demonetization announcement, there was a scramble by the general public to find ways to get value for their currency notes for which they did not have proof of taxes being paid. A variety of schemes have been reported, including the purchase of jewelry,[29] purchasing tickets on Indian Railways (an arm of the Government) to then later cancel the tickets and get "official" cash back from the Railways,[30] bribing bank and government officials, backdating accounting entries, and giving money to temples in order to get it back later in some form.[31]

As the government sought to block these types of schemes, it appears that people started trying to deposit money into bank accounts of other people (typically those with less than INR 250,000 to deposit) in order to avoid questioning on the source and tax status of the income.[32] This of course involved a fair amount of risk that the depositor might not give the money back to the original party. It appears that intermediaries arose (seemingly instantaneously) who would – for a price – offer to help someone split their

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[29] Rutam Vora, "Gold rush keeps jewelers buzzing past midnight", *Business Line*, *The Hindu*, November 9, 2016. Available at: http://www.thehindubusinessline.com/markets/gold/gold-rush-kept-jewellers-buzzing-past-midnight/article9323397.ece.

[30] Manthank Mehtal, "Railways sets Rs. 5000 as cash refund limit for tickets", *Times of India*, November 16, 2016. Available at: http://timesofindia.indiatimes.com/city/mumbai/Rlys-sets-5000-as-cash-refund-limit-for-tickets/articleshow/55444673.cms, "No cash refunds for cancelled tickets above Rs. 10,000, *The New Indian Express*, November 10, 2016. Available at: http://www.newindianexpress.com/business/2016/nov/10/no-cash-refunds-for-cancelled-tickets-above-rs-10000-1537114.html, Siddharth Prabhakari, "Railway tickets booked between Nov 16 and 24 for Rs 5,000 and above won't be refunded in cash", *Times of India*, November 15, 2016. Available at: http://timesofindia.indiatimes.com/india/Railway-tickets-booked-between-Nov-16-and-24-for-Rs-5000-and-above-wont-be-refunded-in-cash/articleshow/55439814.cms.

[31] Pranshu Rathi, "Back-dated receipts used for Apple iPhone sales after demonetisation: Report", IB Times, November 29, 2016, available at: http://www.ibtimes.co.in/back-dated-receipts-used-apple-iphone-sales-after-demonetisation-report-706095, Khushboo Narayan, "Tiffin service to dental implants: All tried to beat system, swap old notes", Indian Express, December 5, 2016. Available at: http://indianexpress.com/article/india/demonetisation-tiffin-service-to-dental-implants-all-tried-to-beat-system-swap-old-notes-income-tax-department-raids-4410874/, Appu Esthose Suresh "Demonetisation violation? Banks accepted over Rs 1 lakh crore without PAN details", *Hindustan Times*, March 16, 2017. Available at: http://www.hindustantimes.com/business-news/demonetisation-in-possible-violation-banks-accepted-over-1-crore-lakh-deposits-without-pan/story-bQbHbFtBgggK7fFh5j0jqI.html, Madhuparna Das, "Enforcement Directorate raids forex shops making back date entries", *Economic Times*, November 16, 2016. Available at: http://economictimes.indiatimes.com/news/politics-and-nation/enforcement-directorate-raids-forex-shops-making-back-date-entries/articleshow/55373554.cms, Ram Sehgal, "Jewellers issue backdated invoices to clients", *Economic Times*, November 10, 2016. Available at: http://economictimes.indiatimes.com/markets/commodities/news/jewellers-issue-backdated-invoices-to-clients/articleshow/55349735.cms.

[32] Khushboo Narayan, "Expect all demonetised money to come back to system: Revenue Secretary Hasmukh Adhia", *Indian Express*, December 8 2016. Available at: http://indianexpress.com/article/business/economy/expect-all-demonetised-money-to-come-back-to-system-revenue-secretary-hasmukh-adhia-4414447/.

cash into smaller chunks and have people ready to deposit who would later give back the money.[33] As this method of evasion became noticeable, the government began to use indelible ink marks on depositors' fingers to ensure that such "marked" depositors would find it more difficult to deposit again.[34]

Despite such government responses, it appears clear that many people were able circumvent the restrictions and deposit their cash (at some cost). This is perhaps most clearly indicated by how much cash came into the banks by December 30, 2016. Prior to demonetization estimates of the total amount of unaccounted for currency were in the range of INR 15.4 Trillion, of which a staggering INR 14.97 Trillion was deposited by December 30, 2016 (roughly 97% and amounting to about USD 220 Billion).[35] This suggests that either the initial estimate of unaccounted for money was too low or that people evaded the restrictions or some mix of both.

This outcome has been viewed by some in the media as evidence of a partial or complete failure of demonetization.[36] Over time, the political discourse surrounding demonetization has shifted, with the Government suggesting that one of its goals was to get more money into the formal sector and jumpstart "cash-less" or e-payments structures.[37] Although that might be viewed as making lemonade from lemons, it is clear

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[33] Swati Bhat and Rahul Bhatia, "While India plugs black money holes, Indians find leaks", *Reuters*, November 11, 2016. Available at: http://www.reuters.com/article/us-india-modi-corruption-taxes-idUSKBN1360UO.

[34] "To reduce crowds at banks, ATMs, indelible ink to mark fingers of those who have exchanged old notes", *Times of India*, November 15, 2016. Available at: http://timesofindia.indiatimes.com/india/Indelible-ink-to-mark-fingers-of-those-who-have-exchanged-cash/articleshow/55431492.cms, Surabhi, "Now, an indelible mark to stop multiple note swaps", *Business Line*, *The Hindu*, November 15, 2016. Available at: http://www.thehindubusinessline.com/money-and-banking/banks-to-use-indelible-ink-to-prevent-repeated-withdrawals-by-same-person/article9348231.ece.

[35] Siddhartha Singh and Bibhudatta Pradhan,"As much as 97% of the Banned Notes Are Back in Banks: Report". NDTV, January 5, 2017. Available at: http://www.ndtv.com/india-news/indians-said-to-deposit-97-of-notes-banned-to-curb-graft-1645071, "97% of scrapped notes deposited with banks as on Dec 30: Report", *Times of India*, January 5, 2017. Available at: http://timesofindia.indiatimes.com/toi-features/business/97-of-scrapped-notes-deposited-with-banks-as-on-dec-30-report/articleshow/56344692.cms.

[36] See "Demonetisation complete failure? 97% of banned notes back in banks: Report", *Indian Express*, January 5, 2017. Available at: http://indianexpress.com/article/business/banking-and-finance/demonetisation-complete-failure-97-of-banned-notes-back-in-banks-report/.

[37] Anuradha Sharma, "If India's Demonetization Was All About Going Digital, Then Why the Rush?", *The Diplomat*, December 1, 2016, Available at: http://thediplomat.com/2016/12/if-indias-demonetization-was-all-about-going-digital-then-why-the-rush/.

that the Government had for some time been trying to increase the size of the banked population and to increase the amount of funds in the formal economy.[38]

The economic disruption caused by demonetization led to the International Monetary Fund revising downwards India's estimated rate of economic growth.[39] However, while demonetization has undoubtedly caused serious disruptions, fears of widespread unrest and chaos have not materialized. For instance, some opposition parties called for strikes and other kinds of resistance activities.[40] There were also lawsuits filed against the demonetization process, but thus far those suits have not borne fruit.[41] Despite these signs of opposition, there has been little political cost of demonetization to the governing party. On the contrary, the Prime Minister and his political party (the BJP) have done very well in state elections following the announcement of demonetization.[42]

3) Stock Market Reactions and the Consequences of Demonetization

[38] See Sharma (2016); which is also bolstered by the Government's efforts toward Aadhar, Jan Dhan and PAN cards amongst others discussed earlier in the text. Arguably, the demonetization event should have generated positive returns for firms offering e-payment and e-wallet platforms. However, this is difficult to test because our sample does not include any specialized e-payment firms (typically, these would be new startups that are not publicly listed). Some banks in our sample offer e-payment products, but it is difficult to distinguish the impact of this from the general effect of demonetization on banks.

[39] See "Note ban: IMF cuts India's growth rate to 6.6% from 7.6%" *Times of India*, January 16, 2017, available at: http://timesofindia.indiatimes.com/business/india-business/note-ban-imf-cuts-indias-growth-rate-to-6-6-from-7-6/articleshow/56601209.cms.

[40] "Demonetisation: Opposition calls for countrywide protest on November 28", *Indian Express*, November 23, 2016. Available at: http://indianexpress.com/article/india/india-news-india/demonetisation-oppostion-parties-countrywide-protest-bandh-call-november-28-4391208/, Manoj CG, "Demonetisation: Opposition parties join hands, to hold 'protest day' on November 28", *Indian Express*, November 24, 2016. Available at: http://indianexpress.com/article/india/politics/demonetisation-opposition-parties-join-hands-to-hold-protest-day-on-november-28-4391937/.

[41] Given the time that has elapsed, one suspects the demonetization would either be held to be legal or a *fait accompli* such that the courts may not intervene. Vidya Venkat, Government's Demonetisation Move Faces Legal Challenge, *The Hindu*, December 2, 2016. Available at: http://www.thehindu.com/news/national/Government%E2%80%99s-demonetisation-move-faces-legal-challenge/article16744775.ece. "Five Reasons Why the Recent Demonetisation May Be Legally Unsound", *The Wire*, November 20, 2016. Available at: https://thewire.in/81325/demonetisation-legally-unsound/. The Delhi High Court ruled that the withdrawal restrictions on cash were not illegal. See *Ashok Sharma* v. *Union of India* [Writ Petition (Civil) No. 11130/2016, order dated 02.12.2016], although this has been appealed to a full Constitution Bench of the Supreme Court of India.

[42] See Ravi Agrawal, "Why the Indian State Elections Matter to the Whole World", *CNN*, March 13. 2017. Available at: http://www.cnn.com/2017/03/11/asia/uttar-pradesh-elections/index.html, "Uttar Pradesh election results: All You Need To Know", *Times of India*, March 11, 2017. Available at: http://timesofindia.indiatimes.com/elections/assembly-elections/uttar-pradesh/news/uttar-pradesh-elections-2017-results-all-you-need-to-know/articleshow/57585921.cms.

3.1) A Simple Illustrative Model of Tax Evasion in the Real Estate Sector

Extensive tax evasion via the use of unaccounted-for cash has been anecdotally discussed in India's real estate sector.[43] In this section, we develop a simple model of evasion in real estate purchases. While the model is highly stylized, it illustrates how estimates of changes in the value of real estate firms around the demonetization announcement of November 8 can potentially be useful in inferring the magnitude of tax evasion.

The Indian Stamp Act of 1899 imposed a tax based on the value of transactions in real property, known as "stamp duty" (e.g. Alm, Annez and Modi, 2004). This tax continues to be imposed on sales of property, with the rate varying across states; for illustrative purposes below, we use a rate of 10% of the property value, which is fairly typical. The legal incidence of stamp duty falls on the buyer of property. However, as illustrated by the bargaining framework we use below, the economic incidence will generally be shared by the buyer and seller. Thus, evasion of stamp duty will in general raise the value of firms selling real estate.

Assume a real estate company that constructs or purchases a building at a cost of C. It then sells the building to a buyer who values it at $V > C$. Stamp duty is imposed on this transaction at a rate t, based on the reported sale price. For instance, if the parties report the true price paid (defined as P_0), then a tax of tP_0 must be paid. Prior to the demonetization announcement, however, the buyer can use unaccounted-for cash for part of the payment, and so the parties can report a price lower than P_0 in order to reduce the amount of stamp duty paid.

In an effort to limit underreporting, many Indian states have imposed a minimum presumptive value of property - known as the "circle rate" - for purposes of stamp duty.[44] Suppose that there is a minimum value M that can be reported, based on the circle rate that is defined by the state government's revenue authority. As long as the circle rate is below the market value (as is likely to be the case when property values are rising and

[43] See e.g. Dhaval Kulkarni "Demonetizatiopn hits real estate hard", *DNA India*, December 2, 2016, available at: http://www.dnaindia.com/mumbai/report-demonetization-hits-real-estate-hard-2278879.
[44] See e.g. Madalasa Venkataraman "Setting Circle Rates for Urban Property Transactions" *Economic and Political Weekly*, Vol. L, No. 11, March 14, 2015, pp. 26-29.

circle rates are revised infrequently) there is some scope for evasion. In our simple setting, the parties always choose to report a price of *M*.

The true price P_0 is assumed to be determined by a process of Nash bargaining between the seller and the buyer, with the seller obtaining a fraction α of the joint surplus. Thus, the true price P_0 can be defined as follows:

$$P_0 = C + \alpha(V - C - tM) \quad (1)$$

The amount of underreporting is thus (P_0 – *M*); the buyer pays *M* using regular ("accounted-for") funds and (P_0 – *M*) using unaccounted-for cash. The ratio of the reported to the true price (on which we focus below) is $\frac{M}{P_0}$. The value of the real estate firm, Π_0, is defined as the price it receives, minus its cost. Thus,

$$\Pi_0 = P_0 - C \quad (2)$$

Note that the government observes *M* (the reported price), but not *V* and P_0. In a complete information setting, it would be possible to infer P_0 using Equation (1) above. However, this is not possible for the government – even if the cost *C* is known – if it does not know the buyer's valuation V.

Now, suppose that a change – such as the demonetization – makes it impossible for buyers to use unaccounted-for cash. Then, all of the funds used for payment are traceable, and the parties must, by assumption, report the true price P_1. This price can thus be defined as:

$$P_1 = C + \alpha(V - C - tP_1) \quad (3)$$

Rearranging,

$$P_1 = \frac{(1-\alpha)C + \alpha V}{1 + \alpha t} \quad (4)$$

The real estate firm's profits are now given by:

$$\Pi_1 = P_1 - C \quad (5)$$

Note that, in general, $P_1 < P_0$.

The proportional change in firm value upon the announcement of the policy change that eliminates unaccounted-for cash can be characterized as follows:

$$\Delta\Pi \equiv \frac{\Pi_1 - \Pi_0}{\Pi_0} = \frac{P_1 - P_0}{P_0 - C} \quad (6)$$

The event study approach that we use is capable of estimating ΔΠ. Thus, assuming that C can be observed, it is possible to infer the unknown value of P_0 by rearranging the equation above:

$$P_0 = \frac{P_1 + C\Delta\Pi}{1 + \Delta\Pi} \tag{7}$$

The magnitude of the estimated ΔΠ can be used to infer the extent of tax evasion behavior prior to the withdrawal of cash. For instance, consider a simple numerical example where C = 80, V = 150, and t = 10%. It follows from Equation (4) that P_1 = 109.5. Suppose that the estimated ΔΠ = 2%. From Equation (7), we can then infer that P_0 = 110. Note that this is consistent with M = 100 – rearranging Equation (1) yields:

$$M = \frac{(1-\alpha)C + \alpha V - P_0}{\alpha t} = 100 \tag{8}$$

It follows that the ratio of the reported price to the true price is 100/110, or approximately 90%. Thus, an estimated ΔΠ = 2% would be consistent with evasion being relatively modest in magnitude.

Alternatively, suppose that (under assumptions that are otherwise the same), the estimated ΔΠ = 8%. From the equation above, we can then infer that P_0 = 112. Note that this is consistent with M = 60 – rearranging Equation (1) yields:

$$M = \frac{(1-\alpha)C + \alpha V - P_0}{\alpha t} = 60 \tag{9}$$

It follows that the extent of evasion, as measured by the ratio of the reported price to the true price is 60/112, or approximately 54%. Thus, an estimated ΔΠ = 8% would be consistent with evasion being substantial in magnitude, with only a little over half the payment being in accounted-for cash. This simple example illustrates that the estimated impact of demonetization on the value of firms can potentially be useful in inferring the magnitude of tax evasion.

This is of course a highly stylized model. For demonetization to have a substantial impact on tax evasion, it is necessary that a large fraction of unaccounted-for wealth was held in cash, and specifically in the form of 500 and 1000 INR notes. However, the available evidence suggests that unaccounted-for wealth is mostly held in other forms, such as jewelry, foreign currency, and various types of assets (Chakravorti, 2017). Moreover, it is also necessary that remonetization (through the newly issued notes) does

not enable the use of cash for tax evasion to the same extent as before. As discussed earlier, once money is in the formal sector then it becomes traceable by the authorities. In particular, various Income Tax Rules and PMLA provisions require reporting of large withdrawals. In principle, this may deter the use of the new notes for tax evasion, but much depends on the efficacy of this tracing process.

Unaccounted-for cash is thought to be widely used not only for tax evasion purposes, but also for making corrupt payments. Similar considerations apply in determining whether it is likely that demonetization could reduce corrupt payments. It would have to be the case that corrupt payments were frequently made in the form of unaccounted-for cash in 500 and 1000 INR notes. Moreover, it would also have to be the case that the traceability of the new notes issued after demonetization deters their use in future corrupt payments to a significant degree.

3.2) Other Hypotheses

Although corruption and tax evasion were the issues most discussed by the government and the media in relation to demonetization, there are other effects to consider. For example, stock market reactions may vary across industries because corruption is more prevalent in certain sectors. To the extent that demonetization is anticipated to reduce corruption, firms in these sectors may be harmed because corrupt payments can no longer be used to evade burdensome regulations; on the other hand, they may benefit because the informal "tax" associated with corrupt payments to officials is reduced. In the empirical analysis, we use a measure of the prevalence of corruption across different sectors (constructed by Transparency International (2011)) to test for such effects. Further, it is also possible that industries that are thought to serve as repositories for unaccounted-for cash (such as real estate and jewelry) may experience negative returns.

Because the demonetization process entailed large deposits in the banking system, it is possible that banks are particularly affected by the November 8 announcement. In particular, if it were anticipated that a substantial fraction of the deposits would not be immediately withdrawn upon remonetization, then the banks would have additional net deposits that could potentially be lent out and generate returns. On the other hand, the demonetization was, as previously described, accompanied by a remonetization; thus, it is

possible that the increase in deposits would be purely transitory, with similar amounts being rapidly withdrawn upon the availability of the new notes. In this latter scenario, no major impact on banks' profitability would be expected.

Related to this, the industries that are more dependent on the type of financing banks provide stand to benefit too because their capital constraints have been eased when banks have more funds available to lend. Industries which are more dependent on external finance than others (e.g., pharmaceuticals) are the ones most likely to benefit from this. In addition, industries that thrive in online environments are also likely to benefit.

In addition to industry effects, it appears useful to examine the effects on firms based on their ownership structure. For example, many Indian firms belong to family run business groups that are thought to keep fairly opaque accounts of inter-affiliate transactions (Khanna and Yafeh, 2007). These firms may present different risks than do standalone private Indian firms or foreign-owned firms. SOEs may behave differently along many dimensions, both because they have a mandate that goes beyond profit-making and because they have more interaction with the State than do other firms. This latter consideration is often a key basis used by organizations in ranking more corrupt industries. SOEs have greater interactions with the State and hence may have more opportunities for corrupt practices. We discuss this possibility further in Section 5 because the connection between ownership structure and corruption has not been something on which most scholars or organizations ranking corruption seem to focus.[45]

This summary indicates that the effects of demonetization are likely to be multifarious and some may take years to be visible in the data. In light of this, our research strategy is to examine the market's reaction to this sudden announcement. We note again that there are reasons to think the market may not fully estimate all effects and many things may be unknown at the time of the market reaction, but the market reaction

[45] There is relatively little literature on this point. Nguyen and van Dijk (2012) find evidence from Vietnam that a corrupt local business environment hinders the growth of non-SOEs but not the growth of SOEs. Lin et al. (2016) analyze market reactions for Chinese firms around a major anti-corruption reform launched on December 4, 2012. They find that SOEs experience positive returns, which they interpret as being consistent with reductions in managers' private benefits. Another recent paper that uses SOEs in a corruption context is Ke, Liu and Tang (2017) but they do not provide a theoretical explanation for why SOEs might be different than other firms from the perspective of corruption. We discuss that issue in greater depth in Section 5.

does reflect the perceptions of individuals and groups that are thought to have a good sense of the pulse of the economy and have strong financial incentives to predict these effects correctly. Their reactions are worthy of exploration and their initial inclinations may contain information of relevance in assessing some of the effects of demonetization. It is to this that we now turn.

4) Data and Empirical Strategy

4.1) Data

Our study uses daily stock price trading data to examine the market's assessment of the likely effects of demonetization around its announcement on November 8, 2016. Stock price data is obtained from Prowess, a comprehensive database on publicly traded Indian firms that is maintained by the Center for Monitoring the Indian Economy (CMIE). Stock price data is available in Prowess for each trading day. We use daily Prowess stock price data through the conclusion of the fiscal year ending on March 31, 2017.

Prowess also provides financial statement data reported on an annual basis, as of the end of each fiscal year (i.e. March 31 of a given year). For the regression analysis described below, we match the event date to the closest corresponding fiscal year to obtain the corresponding financial statement data (in particular, the November 8, 2016 event date is matched to the 2016 fiscal year, the most recently completed fiscal year as of that event date). Our regression analysis uses data on total assets, profits (in particular, profits before depreciation, interest and taxes), advertising, and marketing expenses from the "consolidated accounts" reported in Prowess.[46] As advertising and marketing have a substantial number of missing values, we follow past literature using Prowess data (e.g. Dharmapala and Khanna, 2013, 2016a) and treat missing observations of advertising and marketing expenses as zeroes. Total assets are used in our analysis primarily as an indicator of firm size, while profits are a measure of the firm's performance. Advertising and marketing expenses serve as proxies for the extent to which firms are "consumer-facing." Firms that sell directly to consumers may have experienced negative reactions

[46] Sales revenue is another potential control variable, but it is not included in our analysis because it is missing for a large fraction of banks. Banks are of particular interest in our study, so it would be problematic to omit them from the analysis.

based on disruption to their sales due to the limited ability of consumers to use cash for purchases for a period following the demonetization announcement.

Prowess also reports the ownership structure of each firm. In particular, Prowess reports whether each firm is part of a business group, under foreign ownership, or an SOE. We use these ownership variables in our analysis to construct indicator variables for SOEs, firms that belong to business groups, and foreign-owned firms.

Another crucial element of our analysis involves classifying firms by industry. Prowess classifies firms into industries using a 5-digit National Industrial Classification (NIC) code. We use the NIC codes to construct indicator variables for specific industries of relevance for our analysis. For example, we construct an indicator variable for banks using the NIC code 64191 (which encompasses "banking services" and "other fee based financial services"). Similarly, we construct an indicator for firms in the real estate sector using NIC codes 68100 ("commercial complexes") and 41001 ("housing construction").

For some of our tests, we use additional data sources. We obtain from Transparency International (2011) a sector-level index of perceptions of bribery. The index is based on a global survey of business executives, and represents an average of the responses to three questions in Transparency International's "Bribe Payers Survey". Respondents were asked "How often do firms in each sector: a) engage in bribery of low-level public officials, for example to speed up administrative processes and/or facilitate the granting of licenses?; b) use improper contributions to high-ranking politicians or political parties to achieve influence?; and c) pay or receive bribes from other private firms?" The resulting index takes on values from 0-10, where higher values indicate less corruption. Transparency International (2011) reports this index for 19 different sectors, ranging from "agriculture" and "light manufacturing" (each of which has the highest value of 7.1, indicating a relatively low susceptibility to corruption) to "public works contracts and construction" (with a value of 5.3, the most corrupt sector). Note that these perceptions of corruption are not specific to India, but rather represent a global assessment by sector. We match these 19 sectors by hand to the 5-digit NIC codes in Prowess. Of the approximately 3000 firms for which we have stock price data, we match 2125 to sectors that are covered by the Transparency International (2011) index.

We also conduct a test of the relationship between stock market reactions to demonetization and a measure of the dependence of different sectors on external finance. Rajan and Zingales (1998) construct a measure of the extent to which firms in a given industry depend on external financing for investment needs. This measure is based on the difference between cash flows from operations and capital expenditures for US manufacturing firms, at the industry level, computed using Compustat data for the 1980's. Higher values of the measure indicate that an industry has a greater need for external finance (i.e. that its capital expenditures exceed its cash flows from operations). While this measure is based on US data, it is intended to reflect fundamental technological characteristics of different industries, and has been widely used in studies of countries around the world. We use an updated version of the Rajan-Zingales measure, constructed by Kroszner, Laeven, and Klingebiehl (2007), using Compustat data for US manufacturing firms for the 1980's and 1990's.

The Rajan-Zingales measure is reported only for manufacturing industries, using International Standard Industrial Classification (ISIC) codes for industries. We translate these ISIC industry codes to the 5-digit NIC codes used in Prowess using a concordance between the ISIC and NIC systems created by Sivadasan (2009).[47] Of the approximately 3000 firms for which we have stock price data, we match 1516 to sectors that are covered by the Rajan-Zingales measure (bearing in mind that the latter only exists for manufacturing industries).

4.2) Event Study Approach

The event of interest in our study is the announcement by the Prime Minister on November 8, 2016. As the announcement was made in the evening after the close of trading, we treat the event date as being November 9, 2016 (the first day on which news of the announcement could have affected prices). Using daily stock price data from Prowess, we compute abnormal returns for the firms in our sample over (-1, +1), (-2, +2), and (-3, +3) event windows, where day zero is November 9, 2016. For example, for the (-3, +3) window, we calculate the market reaction for each firm over a period extending from 3 trading days prior to the event to 3 trading days following the event).

[47] We are grateful to Jagadeesh Sivadasan for providing this concordance, and to Rafeh Qureshi of the Coase-Sandor Institute for Law and Economics for assistance with the matching of these codes.

Event studies use a variety of approaches to estimate firms' normal or predicted returns. We use the market model, which does not rely on any specific economic assumptions. The market model uses daily returns for each firm *i* and for the market, and can be represented as follows (e.g. Bhagat and Romano, 2002, p. 146; Dharmapala and Khanna, 2016a, b):

$$R_{it} = a_i + b_i M_t + e_{it} \tag{10}$$

where R_{it} is firm i's return on day t, M_t is the market return on day t, and e_{it} is the error term. We run this regression separately for each firm over an estimation window that consists of a year of daily returns data prior to the (-3, +3) event window. We use the results to compute a predicted return ($\widehat{R_{it}}$) for each firm on each day of the relevant event window. Specifically, $\widehat{R_{it}} = \hat{a} + \hat{b} M_t$, where $\hat{a}$ and $\hat{b}$ are the estimated coefficients from the regression in Equation (10) for each firm i. We then subtract this predicted return from the actual return (R_{it}) on each day of the event window to obtain the abnormal return (AR_{it}) for each firm *i* on each of the days in the event window. Thus,

$$AR_{it} = R_{it} - \widehat{R_{it}} \tag{11}$$

These abnormal returns are then summed to compute cumulative abnormal returns (CARs) for each firm for each of the event windows:

$$CAR_i = \sum_t AR_{it} \tag{12}$$

Here, CAR_i is the CAR experienced by firm *i* over the relevant event window. To address potential outliers, the CARs are Winsorized at 5%.

We then use a straightforward ordinary least-squares (OLS) regression to test how these CARs vary with industry, ownership structure, and other firm characteristics. This regression specification can be represented as follows:

$$CAR_i = \alpha + \sum_{j=1}^{k} \beta_j I_{ij} + \beta_{k+1} SOE_i + \beta_{k+2} Group_i + \beta_{k+3} Frn_i + \boldsymbol{X}_i \gamma + \epsilon_i \tag{13}$$

CAR_i is the CAR computed for firm *i* around the event date, as described above, and α is a constant. For each of *k* different industries, I_{ij} is an indicator variable that is equal to one if firm *i* belongs to industry *j*, and is zero otherwise. For instance, we focus on specific industries of interest, such as banking and real estate. SOE_i is an indicator variable equal to one for firms classified by Prowess as state-owned. $Group_i$ is an

indicator variable equal to one for firms classified by Prowess as belonging to a business group. Frn_i is an indicator variable equal to one for firms classified by Prowess as being foreign-owned. $\mathbf{X}_i$ is a vector of control variables (in the reported results, these are total assets, profits, advertising expenditures, and marketing expenses for fiscal year 2016), and ϵ_i is the error term.

Table 1 reports summary statistics for the CARs for each of the event windows, as well as for the other variables used in the regression analysis. The average CAR is negative across all event windows. However, it is difficult to reach any firm conclusions on this basis, because of the potential confounding events such as the US Presidential election. Note that the number of firms for which we are able to compute CARs varies slightly across the different windows. This is because, for instance, a firm may have missing price data on the +1 day, making it impossible to compute the (-1, +1) CAR, while it has price data on days +2 and +3, enabling the computation of CARs for the longer windows.

5) Results and Discussion

5.1) Basic Results

Table 2 presents the mean CAR for firms in each of three particularly noteworthy sectors, using the shortest window (i.e. (-1, +1)). Standard errors are computed by regressing the CARs for the firms in each category on a constant. Note, however, that inferences using bootstrapped standard errors are very similar to those using the conventional standard errors reported in Table 2. As shown in Table 2, the CARs experienced by firms in the real estate sector was around -3%, and is statistically significant. This is consistent with our hypothesis that the real estate sector would be negatively impacted as it serves as a repository for unaccounted-for cash. However, the magnitude of this effect is relatively modest; it is closer to the first of the two stylized scenarios described in Section 3.1 (see Equation (8)), where the fraction of real estate prices paid in the form of unaccounted-for cash is quite small. Alternatively, it may be the case that tax evasion is widespread, while the modest market reaction reflects an expectation that demonetization would have little impact on the prevalence of tax evasion.

However, we wish to highlight some important caveats. First, our results are only for publicly traded firms, and there are of course many real estate firms that are not publicly traded. Moreover, the publicly traded firms must disclose to the market more than private firms and hence may tend to be more transparent. Second, the real estate market may be subject to offsetting effects. For example, if banks received a large long-term infusion of funds then one of the markets in which they may disburse those funds is the home mortgage market (given its high growth rate in recent years (Khanna, 2017)), which would then have a positive effect on the real estate sector. Further, to the extent that people believe unaccounted-for cash will be less prevalent in real estate going forward then perhaps additional foreign investment might come into real estate and that could have an offsetting effect.[48]

Generally consistent with this result for the real estate sector is the absence of any detectable relationship between the CARs we compute and the Transparency International index of sector-level corruption. As there are only a limited number of values that this index takes on, Figure 1 shows a scatterplot that represents the mean CAR for each value of the index. It also shows a line of best fit, computed using all of the CARs (as opposed to just the mean CARs for each index value). This line is essentially horizontal. Indeed, if anything there is a slight positive slope, indicating slightly larger effects for less corrupt industries (the opposite of what might be expected). Moreover, regressing the CARs on the corruption index yields a coefficient that is small in magnitude and statistically insignificant.

Overall, these findings suggest that the market expected the effects of demonetization on corruption and tax evasion across the economy to be modest at best. In contrast, the results for banks and SOEs are rather more striking. Table 2 shows that the mean CAR for firms in the banking sector is positive and statistically significant at the 1% level. This effect (of around 3%) seems to indicate that investors expected the banking sector to benefit from demonetization, despite the various arguments discussed in Section 3 for why any impact on bank profits may be limited. Our third result relates to SOEs, which had a mean CAR that is both positive and significant at the 1% level. This

[48] Alex Frew McMillan "2017 is Going to be a Good Year for India's Property Market", *Forbes*, December 21, 2016, available at: https://www.forbes.com/sites/alexfrewmcmillan/2016/12/21/2017-is-going-to-be-a-good-year-for-indias-property-market/#578f97103409.

effect (of around 2%) is consistent with our hypothesis that SOEs may be impacted differently than other types of firms. We explore potential explanations for this in our discussion below.

As noted earlier, it is possible that firms that sell products directly to consumers (in situations where cash transactions are likely to predominate) may have experienced negative reactions - unrelated to corruption or tax evasion - based on disruption to their sales. There is no direct measure of this characteristic, so we use advertising and marketing expenses as proxies for the extent to which firms are "consumer-facing." In particular, we compute the ratio of advertising expense to total assets, and define firms as highly consumer-facing if this ratio exceeds the mean (where the mean is computed for the subsample of firms that report strictly positive advertising expense). An analogous variable is defined for marketing expenses. Table 2 shows that firms that are defined in this way as "consumer-facing" experienced a statistically significant -2% abnormal return, providing some evidence of an effect on consumer transactions. In the regression analysis, an indicator variable for these "consumer-facing" firms is also generally negative, but is not statistically significant across all event windows. Note, however, that the regression analysis described below controls for advertising and marketing expenses, so that the results we obtain take account of any effect of demonetization on consumers' cash transactions.

5.2) Portfolio Analysis

As all firms experienced the Prime Ministerial announcement on the same day, a potential problem for inference is the possibility of cross-correlation of returns across firms within the same sector on the event dates. One approach to addressing this potential problem is to aggregate the firms within a given sector into a single portfolio and to estimate the portfolio CARs around the event date (e.g. Kothari and Warner, 2007). This procedure renders moot any cross-correlation among the returns of firms within sectors. We thus aggregate all the banks in our sample into a single bank portfolio. Figure 2 shows the abnormal returns for this bank portfolio within the (-3, +3) window and for the subsequent period up to March 31, 2017 (the last trading day for which we have Prowess daily stock price data). There is a large positive abnormal return of over 4% on November 10 that is statistically significant (the test statistic is 2.6). This is followed by

positive portfolio returns on the subsequent two days that are smaller in magnitude, although not statistically significant.

A quite similar pattern exists for a portfolio consisting of all SOEs in our sample, as shown in Figure 3. There is a large positive abnormal return of about 2.6% on November 10 that is statistically significant (the test statistic is 2.1). This is followed by positive portfolio returns on the subsequent two days that are smaller in magnitude and are not statistically significant.

Recall that the bank and SOE reactions to the demonetization event are puzzling in some respects, and that (as discussed above) it is possible that stock market investors were mistaken in their initial reactions. If so, we would expect the initial reaction to reverse over time. The relatively long post-event period - of about five months, up to March 31, 2017 – for which daily stock price data is available in Prowess provides an opportunity to test for such a reversal.

For both the banking and SOE portfolios, the reactions around the demonetization event are quite exceptional, in that their magnitude is larger than the reaction on any day subsequent to the event window. Moreover, reactions on days after the event window are generally not statistically significant. If we leave statistical significance to one side, and sum the bank portfolio returns shown in Figure 2, there is some evidence of reversal but it is not of sufficient magnitude to offset the initial positive reaction within the event window. The reaction around the event for the bank portfolio is about 4.5% to 6% (depending on the event window). The sum of the post-event window returns (up to March 31, 2017) is -1.6%. Even if we ignore the latter's lack of statistical significance, the net effect (of about 3% to 4.5%) remains positive and quite substantial in magnitude.

The conclusions are quite similar for the SOE portfolio. The reaction around the event for the SOE portfolio is about 2% to 2.5% (depending on the event window). The sum of the post-event window returns (up to March 31, 2017) is about -1%. Even if we ignore the latter's lack of statistical significance, the net effect (of about 1% to 1.5%) remains positive. Thus, there is at most some limited evidence of partial reversal in market reactions for the bank and SOE portfolios. Overall, both banks and SOEs experienced positive returns around the demonetization announcement, and any subsequent reversal was too small in magnitude to offset these initial reactions. Thus, it

appears that stock market investors did not fundamentally reconsider their initial expectations about the consequences of demonetization for banks and SOEs (at least during the subsequent 5-month period).

5.3) Regression Results

Table 3 reports the results of the regression specification shown in Equation (13), for all three of the event windows. The regressions include various industry and ownership dummies. The final column of Table 3 adds in the financial statement variables in the vector **X** as controls. Table 3 reports robust standard errors, but the results are very similar when standard errors are clustered at the industry level (by 5-digit NIC code).

The strong results for banks and SOEs are robust to using this regression specification, and indeed are somewhat larger in magnitude. The effect for banks varies from about 4% to 7%, depending on the specification, and is statistically significant across all specifications. The effect for SOEs varies from about 2% to 6%, depending on the specification, and is statistically significant across all specifications.

The effect for real estate is negative (as in Table 2). It varies in magnitude from about -2% to -4%, depending on the specification, and is statistically significant across all specifications. Differential effects for foreign-owned and business group firms are small in magnitude and generally insignificant. There is also no other industry that experiences market reactions that are consistently significant across the event windows, and the magnitudes are generally small. The one exception is the pharmaceutical and health sector, for which the effect varies from about 1% to 2%, depending on the specification, and is statistically significant across all specifications. We discuss this below in the context of the results relating to industries' external financial dependence.

As the US presidential election of November 8, 2016 has the potential to confound these effects (as discussed earlier in the Introduction), it is noteworthy that the information technology sector – which has close ties to the US and is potentially vulnerable to US trade and immigration policies – experiences only small (and statistically insignificant) market reactions. This reinforces our earlier point that it is unlikely that the US election would have a substantial impact in India at the industry

level, even though it may well have affected the general level of the Indian market around this time.

5.4) The Banking Sector and Financial Constraints

It appears that investors anticipated at the time of demonetization that the profits of banks would be positively affected. This entails an expectation that demonetization would result in a persistent (rather than transitory) increase in financial sector deposits. Indeed, the observed reaction requires that the market believed that demonetization would lead to a substantial and persistent shift in the form of savings by the public in India, specifically from unaccounted-for cash to bank deposits. Of course, the announcement was expected to lead (as it in fact did) to a massive inflow of new deposits at banks. However, to explain a substantial increase in the value of banks' equity, it is necessary that these deposits were expected to not be withdrawn (or otherwise used for consumption, for instance through electronic payments) in the short-to-medium term. This scenario would enable banks to increase lending or other profitable activities.

One approach to exploring the banking sector result further is to look at the industries that would be most likely to receive some of the incremental investible funds that investors seem to have expected banks to receive as a result of demonetization. To do so, we use the Rajan and Zingales (1998) measure of external financial dependence (updated by Kroszner et al. (2007), as described in Section 4). Figure 4 presents a scatterplot of the results. As there are only a limited number of values that the external dependence measure takes on, Figure 4 shows a scatterplot that represents the mean CAR for each value of the index. It also shows a line of best fit, computed using all of the CARs (as opposed to just the mean CARs for each index value). This line is clearly positive in slope. This is consistent with the notion that firms in industries with higher external finance dependence scores were thought by the market to benefit more from demonetization than firms from industries with lower scores.

Table 4 reports regressions of the CARs on the external dependence measure. We control for an industry's corruption perception according to Transparency International (2011), and in Column 4 we control for the same set of financial statement variables as in Table 3. The table reports robust standard errors that are clustered at the industry level (by 5-digit NIC code). We find a positive and statistically significant relationship across

all event windows. A 1-unit increase in ED (e.g. from the level of "food products" to that of "plastic products") is associated with a higher abnormal return around the event of between 0.5 percentage points and 1 percentage point, depending on the event window. This magnitude entails that a one standard deviation increase in the external dependence measure is associated with a higher CAR around the event of between about 0.4 percentage points and about 0.7 percentage points (e.g. if the counterfactual return were -1%, then the firm would experience a return of between -0.6% and -0.3% as a result of having external dependence that is one standard deviation higher).

This result when taken together with the result for the banking sector suggests that when banks obtain more funds the market expects that these funds will be disbursed to firms in those industries that are more dependent on external finance. As further evidence consistent with this account we note that the pharmaceutical industry is the one industry (outside of banking) to show a consistently positive and significant result (see Table 3). The pharmaceutical industry is the most dependent on external finance, according to the Rajan-Zingales measure. We thus treat this evidence as consistent with the account that the increase in deposits is perceived by the market to profit banks and benefits those sectors that are the most likely to seek bank finance.

Assessing whether this apparent market expectation was reasonable is quite complicated. At a fundamental conceptual level, it is unclear why demonetization (followed by remonetization) would by itself affect households' demand for cash and cash equivalents. More specifically, one of the key conditions required to explain the result is that individuals did not withdraw their deposited amounts quickly or at least left them in the banks long enough that banks would have sufficient time to invest these funds and earn returns to justify the large CARs. The magnitude of the market reaction cannot be readily explained without assuming that the market expected a fairly persistent increase in bank deposits and financial depth.[49]

[49] The aggregate market capitalization of the banks in our sample at the end of the estimation window (i.e. on November 3, 2016) was about INR 13.5 trillion. A market reaction of about 5% (within the range that we estimate) thus implies an increase in (after-tax) value of about INR 0.7 trillion; in turn (assuming a 35% corporate income tax rate), this requires a pretax increase in value of INR 1.1 trillion. World Bank data (available at http://data.worldbank.org/indicator/FR.INR.LNDP?end=2016&start=1960) suggests a global average interest rate spread between deposits and loans of about 6% (although the figure for India is missing). Using this 6% spread, it would be necessary for loanable deposits to increase by nearly INR 20 trillion for one year in order to generate an additional return of INR 1.1 trillion (note, however, that this

In the first few weeks after the announcement it appears that deposits outpaced withdrawals by around a ratio of 4 to 1.[50] One simple explanation for this is that the government had limited the withdrawal amounts since demonetization was announced to levels that are substantially below those for deposits. This naturally creates an imbalance. However, even as the limits on withdrawals were gradually lifted (a process that was completed by March 13, 2017) it does not appear that withdrawals have increased dramatically. One explanation for this is that following shortly after the demonetization announcement, the government made various changes to the law that might have enhanced the visibility of moves to withdraw large amounts of money and appear to be using those laws to target their tax evasion enforcement efforts. These steps might also make people more concerned about withdrawing large amounts.[51] Further, some of the schemes the government provided between November 9, 2016 and December 30, 2016 (such as the Taxation and Investment Regime for Pradhan Mantri Garib Kalyan Yojana) allow depositors to retain more of their deposits value if they leave it untouched with the bank for some time – thereby limiting withdrawals as well. It is, however, possible that withdrawals rates will begin to pick up over time. On the other hand, it is also possible that people may increasingly prefer to be in the formal sector and get the advantages that it increasingly offers (e.g., e-payments).[52] Which of these future behavioral patterns is

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does not take into account the fees that may be earned by banks on deposits or other transactions, even if these are subsequently withdrawn quickly). This amount significantly exceeds the INR 15 trillion amount that was deposited following demonetization (see e.g. "97% of scrapped notes deposited with banks as on Dec 30: Report", *Times of India*, January 5, 2017, available at: http://timesofindia.indiatimes.com/toi-features/business/97-of-scrapped-notes-deposited-with-banks-as-on-dec-30-report/articleshow/56344692.cms).

[50] Sunny Verma, "Pradhan Mantri Garib Kalyan Yojana: Post 'last chance' IDS, comes a new declaration scheme", *Indian Express*, November 29, 2016. Available at: http://indianexpress.com/article/business/business-others/pradhan-mantri-garib-kalyan-yojana-ids-scheme-4400491/.

[51] It also appears that from April 1, 2017 cash transactions in excess of INR 200,000 are prohibited. "Cash transaction limit slashed to Rs. 2 lakh", *The Hindu*, March 22, 2017. Available at: http://www.thehindu.com/news/national/cash-transaction-limit-slashed-to-rs-2-lakh/article17561911.ece.

[52] See e.g., Prithraj Panigrahi, "Bank Deposit Growth Continues even as Restriction on Cash Withdrawals are Removed", *CEIC Blog*, May 26, 2017. Available at: https://www.ceicdata.com/en/blog/india-banks-liquidity. "Cash withdrawal from banks falling at faster pace after demonetization", *News Nation*, April 04, 2017, available at: http://www.newsnation.in/business-news/economy/cash-withdrawal-from-banks-falling-at-faster-pace-after-demonetisation-article-167128.html.

It is also an interesting, albeit open, question what people who had deposited unaccounted for money would do after it was deposited. These individuals would have paid some money to effect the deposit – either to intermediaries for evading the higher taxes or to the government in the form of taxes and penalties. However, once that occurs and the fees/penalties have been paid what is the advantage of taking

more likely is difficult to conclusively determine at this time, although early evidence suggests withdrawals may have declined.[53]

The Reserve Bank of India (RBI) changed the incremental reserve ratio for banks to prevent an increase in lending out of the new deposits. Such a measure would, had it persisted, have affected the ability of banks to generate profits from the new deposits. However, this measure was short-lived. It was announced on November 26, 2016 as a temporary measure that would be revisited or expire on or before December 09, 2016. On December 07, 2016 the RBI announced that the November 26 measure would be removed with effect from December 10, 2016.[54]

For our purposes the key issue is whether the market reaction around November 8, 2016 for the banking sector is plausible given the potential for withdrawals following deposits. We think the market is likely to have thought that individuals depositing large amounts of money may not try to immediately withdraw those funds both because there were limits on withdrawals, but also because it might invite unwanted scrutiny for a variety of reasons. Although some of the enhanced scrutiny methods came shortly after the event window (suggesting that the market may not have known of them), these methods were probably in a class of steps one might anticipate a government would take after taking a huge political risk like demonetization of the scale adopted in India. Moreover, some of the unattractiveness of taking large withdrawals from bank accounts were present before demonetization too (e.g., the PMLA). In light of this, it appears reasonable to think that the market expected a good portion of the deposits would not be withdrawn in the short to medium term.[55]

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the money out of your account to push back into "black" money? If one wanted to use the cash for corruption payments and so forth then it would presumably be better to do that with cash than directly from bank account payments. However, taking out large amounts of cash is bound to attract law enforcement attention, thus increasing the risk of being caught or the risk of having to pay additional bribes to prevent additional law enforcement scrutiny. At the margin the value of keeping cash should have reduced somewhat (though how much is hard to tell this early on).

[53] *Ibid.*, and "RBI need not print entire amount of extinguished currency: Report", *Money Control*, March 31, 2017. Available at: http://www.moneycontrol.com/news/business/economy/rbi-need-not-print-entire-amount-of-extinguished-currency-report-2250553.html.

[54] See RBI Circular, DBR.No.Ret.BC.41/12.01.001/2016-17, November 26, 2016 imposing limit and RBI Circular, DBR.No.Ret.BC.46/12.01.001/2016-17, December 7, 2016 removing limit.

[55] Consistent with this expectation are news reports suggesting that a large bank, the State Bank of India, was faced with the challenge of finding suitable investment opportunities for the extra deposits it received – see Vishwanath Nair "Demonetisation Leaves State Bank of India Scrambling To Deploy Surplus

5.5) Explaining the SOE Result

To probe the SOE result further, we note that many of India's banks are SOEs and perhaps the bank SOEs are driving the overall SOE result. In Table 5, we examine this question. Column (1) confirms the results we have obtained in Table 3 that banks and SOEs each experience positive and statistically significant CARs. We add here an interaction term between banks and SOEs. This shows that the positive reaction for SOE banks is significantly larger than that for nonbank SOEs; nonetheless, nonbank SOEs also experience statistically significant (albeit smaller) positive returns, suggesting that the bank SOEs are not driving the overall SOE result. Column (2) excludes all SOEs and finds a positive and significant result of around 6% for non-SOE banks. This indicates that the banking sector effect applies to non-SOE banks (as well as to SOE banks). Column (3) includes only SOEs and finds that the bank dummy is positive and significant with an even larger coefficient (of around 10%). Finally, Column (4) excludes banks and finds that the SOE dummy is still significant and positive at around 4%. This reinforces the idea that it is not the bank SOEs that are driving the overall SOE results.

To explore this further, we examine the market reaction in relation to the corruption index for the sample of non-bank SOEs. Although this restricts the sample size to 47, the result (presented visually in Figure 5) is intriguing. Here we see that the lower the corruption score (i.e., the more corrupt the industry) the stronger the effect. In other words, SOEs in industries that are thought to be more corrupt appear to have a larger CARs, consistent with the notion that demonetization appears to have increased the value of SOEs, particularly in corrupt industries. Although the relationship in Figure 5 is not statistically significant (perhaps due to the small sample size), the pattern is intriguing.

The SOE results are consistently positive and significant but are somewhat difficult to explain. One explanation is that the increase in deposits at banks, many of which are state owned, might lead to more funds being available for SOEs. While we cannot exclude this account, we think it is not very likely. Few SOEs are considered very profitable and so SOEs are unlikely to be particularly appealing as borrowers from the perspective of non-state owned banks. Of course, this does not preclude SOE banks from

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Deposits" *BloombergQuint*, May 23, 2017, available at: https://www.bloombergquint.com/business/2017/05/23/demonetisation-leaves-state-bank-of-india-scrambling-to-deploy-surplus-deposits.

engaging in such financing of SOEs for non-profit driven reasons. However, if bank SOEs were likely to provide capital to poorly performing SOEs, then we would expect to see that the market would respond with a larger positive reaction for private banks than for SOE banks. Table 5 shows that the market responded in the opposite manner – SOE banks experienced an even larger positive reaction than private banks. For these reasons, we are skeptical that access to the incremental bank deposits is what explains this result.

Second, it is conceivable that if the Government obtains an increase in tax collections then that might inure to the benefit of SOEs by providing them with more capital. There is some evidence of an increase in at least municipal tax collections since demonetization.[56] However, this does not explain why non-bank SOEs in more corrupt industries seem to have a more positive reaction than those in less corrupt industries (though this result is not significant).

We think a third explanation may be worth examining – that the potential corruption reducing effects of demonetization might be showing up in results on SOEs. This builds on the notion that one of the key reasons why some industries are considered more prone to corruption than others is interaction with the government through regulation or other mechanisms. If interaction with the government can be a proxy for corruption risk, then being owned by the government might similarly be a proxy for corruption risk. If this is correct then if demonetization is perceived by the market to reduce corruption (directly or indirectly) then we would expect to see an increase in CARs for SOEs.

If this SOE result is the result of reduced perceptions of corruption then that raises questions about why that might be. One explanation is that SOEs are – for reasons just discussed – more likely to suffer from corruption and hence more likely to benefit from any perceived reductions in corruption. Moreover, it is possible that the extent to which SOEs are susceptible to corruption, relative to non-SOEs, is much greater than the differences in corruption *among* non-SOEs that the Transparency International and other indices seek to capture. This can potentially explain a large effect for SOEs, even though

[56] See Moushumi Das Gupta "Demonetisation windfall: Civic agencies record 268% increase in tax collection" *Hindustan Times*, November 23, 2016, available at: http://www.hindustantimes.com/india-news/demonetization-windfall-civic-agencies-record-268-increase-in-tax-collection/story-O3YsryY0WtdefZy8vdBMFM.html

there is little evidence that market reactions to demonetization were related to the prevalence of corruption in different industries.

In addition, when the government decided to act in an unprecedented manner that carried great political and economic risk, it may have sent a (quite costly) signal about its seriousness in curtailing corruption. Much scholarly discussion of corruption envisages it as an equilibrium in which expectations are self-fulfilling. The government taking this large and potentially very risky step is likely to make people reconsider their expectations and perhaps move the equilibrium. It may be that the if demonetization is treated as a signal of future anti-corruption efforts then perhaps the place where the government may first tackle these issues is in SOEs as the government is most able to influence their behavior. Broadly speaking, the marginal productivity of the government's greater likelihood of policing corruption is likely to be highest where there is the most corruption and where the government has the greatest ability to influence it – the SOE sector.

In addition to the intrinsic interest in this finding it also raises the prospect – which is to the best of our knowledge not pursued in depth in the corruption literature – that the ownership of firms may also serve as a proxy for corruption risk along with industry. SOEs may proxy for interaction with the state as does industry. Further, foreign ownership (due to their home country standards) and business groups (due to opacity) may also serve as useful indicia of corruption risk (although they do not experience consistently different returns in the context that we study). We think this may prove to be an intriguing additional measure of corruption risk to those that already exist in the literature. However, we leave further inquiry for future research.

6) Conclusion

India's November 8, 2016 demonetization was perhaps one of the most dramatic moves a government has made in the name of reducing corruption and tax evasion. Although a full assessment of the effects of demonetization is surely many years away, stock market reactions around the announcement date provide a window into investors' expectations about the longer-term impact of demonetization on different sectors of the economy and on different types of firms. They also potentially provide insights into the

phenomena of corruption and tax evasion, and the channels through which tools to address them may operate.

We compute abnormal returns for firms on the Indian stock market around this event, and compare patterns of abnormal returns for different subsamples of firms defined by industry, ownership structure, and other characteristics. We find little evidence that sectors thought to be associated with greater tax evasion or corruption experienced significantly different returns. However, we find substantial positive returns for banks and for SOEs. The effect for banks appears to indicate a market expectation of a persistent increase in the form of savings from unaccounted-for cash to bank deposits – i.e. an increase in financial depth. This is reinforced by a pattern of higher returns for industries that are characterized by a greater dependence on external finance, which possibly reflects an expectation of an easing of financial constraints. The returns for SOEs may be due to possible indirect effects of the announcement on perceptions of future corruption among these firms. This effect highlights the need for further inquiry into how SOE status affects perceptions of corruption.

As was highlighted earlier, there are many important caveats regarding inferences from stock market reactions. Most importantly, there is no guarantee that investors' expectations will turn out to be correct, especially for such an unprecedented event. Nonetheless, stock market reactions represent a valuable "first rough draft" of the effects, given investors' knowledge and financial incentives to predict these effects correctly.

It is also important to bear in mind that these stock market reactions do not tell us whether demonetization was an economic and development success or failure. There are many complex benefits and costs – such as the extensive economic disruption – that would have to be taken into account to make an overall assessment. The stock market reactions that we study provide only a partial picture, but these types of effects are an important element of any overall evaluation.

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Table 1: Summary Statistics

Variable	Mean	Standard Deviation	Number of Observations
CARs:			
(-1, +1) Window	-0.01387	0.0464	2919
(-2, +2) Window	-0.0146	0.0626	2991
(-3, +3) Window	-0.0508	0.0872	3029
Ownership Variables:			
SOE = 1	0.0337	0.1804	3415
Business Group = 1	0.3593	0.4799	3415
Foreign-owned = 1	0.0340	0.1812	3415
Financial Statement Variables:			
Total Assets	123177.3	904798.9	1661
Profits	11653.55	73767.38	1661
Advertising Expenditures	93.33	936.5891	3415
Marketing Expenditures	189.33	1729.675	3415
Other Variables:			
Corruption Index	6.699	0.5023	2125
External Dependence	0.1805	0.7321	1516

Note: Cumulative abnormal returns (CARs) around the demonetization event are computed using the market model, and are Winsorized at 5%. The ownership variables for State-owned Enterprises (SOEs), business group firms and foreign-owned firms are indicator variables from Prowess. Financial statement variables are also from Prowess, and are reported in millions of INR. Missing values for advertising and marketing expenditures are treated as zeroes. The corruption index is from Transparency International (2011). The external dependence measure captures industry-level dependence on external finance, and is from Kroszner, Laeven and Klingebiehl (2007), representing an updated version of the measure constructed in Rajan and Zingales (1998).

Table 2: CARs for Selected Sectors and Subgroups of Firms around November 9, 2016

Sector or Subgroup of Firms	**Window (-1, +1)**	**Market Reaction** Mean CAR (Standard error) (Number of firms)
Real Estate	November 8 – November 10, 2016	-0.0326*** (0.0050) (104)
Banking	November 8 – November 10, 2016	0.0305*** (0.0059) (64)
State-Owned Firms	November 8 – November 10, 2016	0.0181*** (0.0044) (89)
Consumer-facing Firms (high ratio of advertising expenses to assets)	November 8 – November 10, 2016	-0.0201*** (0.0036) (133)
Consumer-facing Firms (high ratio of marketing expenses to assets)	November 8 – November 10, 2016	-0.0163*** (0.0022) (335)

Note: This table reports mean cumulative abnormal returns (CARs) around the demonetization event. CARs are computed using the market model, and are Winsorized at 5%. The event window is a [-1, +1] window around the November 8, 2016 announcement of demonetization. In the fourth row, "consumer-facing" firms are defined as those with a ratio of advertising expenses to assets that exceeds the mean (among those firms that report strictly positive levels of advertising expenses). In the fifth row, "consumer-facing" firms are defined as those with a ratio of marketing expenses to assets that exceeds the mean (among those firms that report strictly positive levels of marketing expenses) Robust standard errors are reported in parentheses.
*: significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3: Stock Market Reactions around November 9, 2016, by Industry and Ownership

	(1) Event Window: (-1, +1)	(2) Event Window: (-2, +2)	(3) Event Window: (-3, +3)	(4) Event Window: (-3, +3)
	Dependent Variable: CAR around Nov. 8, 2016			
Banks = 1	0.03856***	0.05260***	0.07225***	0.05094***
	(0.006)	(0.007)	(0.010)	(0.016)
Real Estate = 1	-0.01779***	-0.02647***	-0.03133***	-0.04543***
	(0.005)	(0.006)	(0.009)	(0.010)
Mining = 1	-0.00534	-0.00789	-0.02379	-0.02384
	(0.009)	(0.012)	(0.017)	(0.019)
Electricity = 1	0.00757*	0.00496	0.01661	0.01240
	(0.004)	(0.009)	(0.013)	(0.015)
Pharmaceuticals	0.01252***	0.01599***	0.01563**	0.02394***
and Health = 1	(0.003)	(0.005)	(0.007)	(0.008)
Telecommunications	0.01075	0.00279	0.01021	0.01821
= 1	(0.011)	(0.013)	(0.020)	(0.031)
Information	-0.00238	-0.00012	0.00785	0.00657
Technology = 1	(0.004)	(0.005)	(0.007)	(0.009)
State-Owned = 1	0.02400***	0.03256***	0.04389***	0.05722***
	(0.004)	(0.005)	(0.008)	(0.010)
Foreign-Owned = 1	-0.00426	-0.00208	-0.00142	0.01136
	(0.004)	(0.005)	(0.008)	(0.009)
Business Group = 1	-0.00160	-0.00117	-0.00786**	0.00674
	(0.002)	(0.002)	(0.003)	(0.005)
Controls for Total				
Assets, Profits,	No	No	No	Yes
Advertising, and				
Marketing?				
Constant	-0.01459***	-0.01599***	-0.05083***	-0.06368***
	(0.001)	(0.002)	(0.002)	(0.004)
Observations	2,895	2,965	3,003	1,355
R-squared	0.039	0.039	0.038	0.077

Note: This table reports regressions where the dependent variable is the cumulative abnormal returns (CAR) for various event windows - [-1, +1], [-2, +2], and [-3, +3] - around the November 8, 2016 announcement of demonetization. Industry dummies are constructed using the 5-digit National Industrial Classification (NIC) codes reported in the Prowess database. Ownership type and controls for total assets, profits, advertising, and marketing are all from the Prowess database; missing values of advertising and marketing expenditures are set to zero. Robust standard errors are reported in parentheses.

*: significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4: Stock Market Reactions and External Financial Dependence

	(1) Event Window: (-1, +1)	(2) Event Window: (-2, +2)	(3) Event Window: (-3, +3)	(4) Event Window: (-3, +3)
	Dependent Variable: CAR around Nov. 8, 2016			
External Dependence	0.00535***	0.00807***	0.01047***	0.01258**
	(0.001)	(0.002)	(0.004)	(0.005)
Corruption Index	-0.00238	-0.00724	-0.00509	0.00324
	(0.005)	(0.007)	(0.011)	(0.012)
Controls for Ownership				
Type, Total Assets,	No	No	No	Yes
Profits, Advertising,				
and Marketing?				
Constant	0.00084	0.03104	-0.02789	-0.09337
	(0.035)	(0.047)	(0.075)	(0.078)
Observations	1,202	1,220	1,228	516
R-squared	0.012	0.017	0.012	0.086

Note: This table reports regressions where the dependent variable is the cumulative abnormal returns (CAR) for various event windows - [-1, +1], [-2, +2], and [-3, +3] - around the November 8, 2016 announcement of demonetization. The external dependence measure is from Kroszner et al. (2007), and represents an updated version of the Rajan and Zingales (1998) measure. The external dependence measure is constructed by International Standard Industrial Classification (ISIC) code for manufacturing industries. The ISIC codes are matched to the 5-digit National Industrial Classification (NIC) codes in Prowess using the concordance in Sivadasan (2009). The corruption index is from Transparency International. Ownership type (state-owned, foreign-owned and business group) and controls for total assets, profits, advertising, and marketing are all from the Prowess database; missing values of advertising and marketing expenditures are set to zero. Robust standard errors clustered at 5-digit National Industrial Classification (NIC) level are reported in parentheses.

*: significant at 10%; ** significant at 5%; *** significant at 1%.

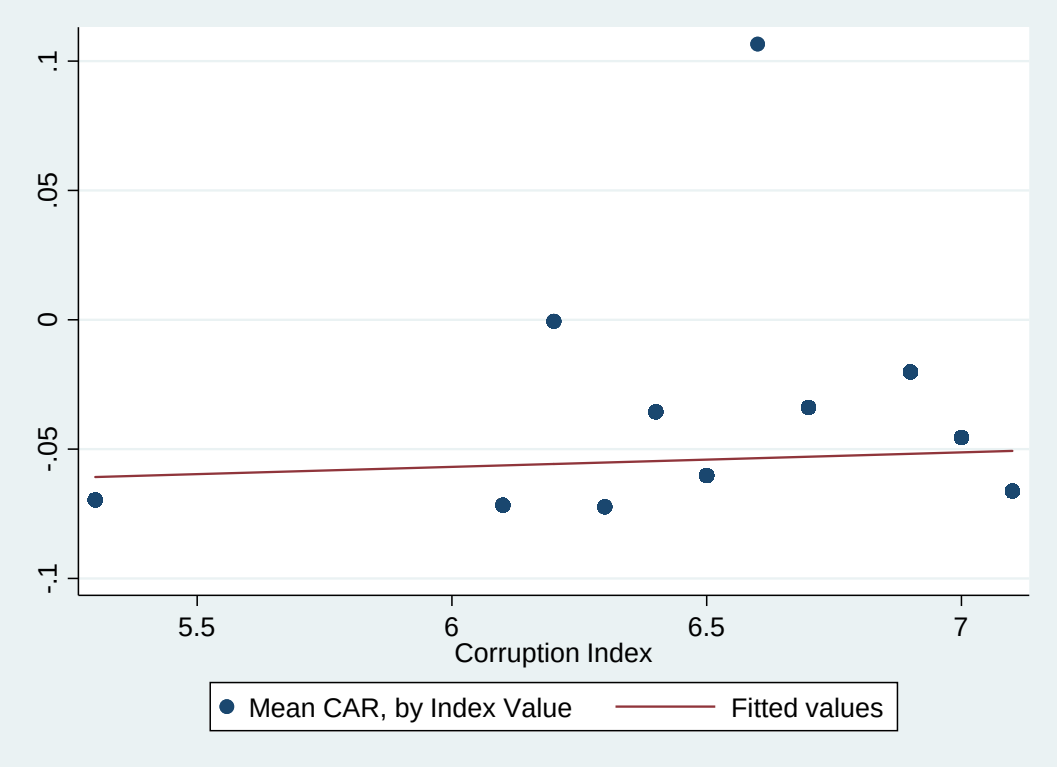
Table 5: Stock Market Reactions for Banks and State-Owned Enterprises (SOEs)

	(1) All Firms	(2) Excluding SOEs	(3) SOEs	(4) Excluding Banks
	Dependent Variable: CAR around Nov. 8, 2016 Event Window: (-3, +3)			
Banks = 1	0.06169***	0.06169***	0.10183***	
	(0.012)	(0.012)	(0.012)	
State-Owned = 1	0.04069***			0.04069***
	(0.009)			(0.009)
Banks*State-Owned	0.04015**			
	(0.017)			
Constant	-0.05367***	-0.05367***	-0.01297	-0.05367***
	(0.002)	(0.002)	(0.009)	(0.002)
Observations	3,003	2,914	89	2,937
R-squared	0.029	0.008	0.286	0.005

Note: This table reports regressions where the dependent variable is the cumulative abnormal returns (CAR) for a [-3, +3] event window around the November 8, 2016 announcement of demonetization. Industry dummies are constructed using the 5-digit National Industrial Classification (NIC) codes reported in the Prowess database. Ownership type is from the Prowess database. Robust standard errors are reported in parentheses.

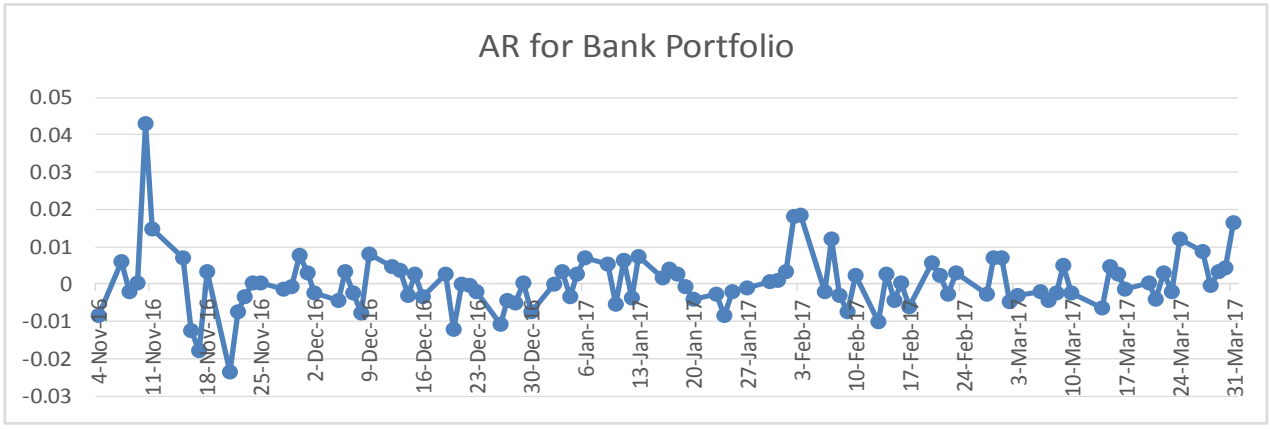
*: significant at 10%; ** significant at 5%; *** significant at 1%.

Figure 1: Stock Market Reactions and the Transparency International Measure of Corruption by Sector



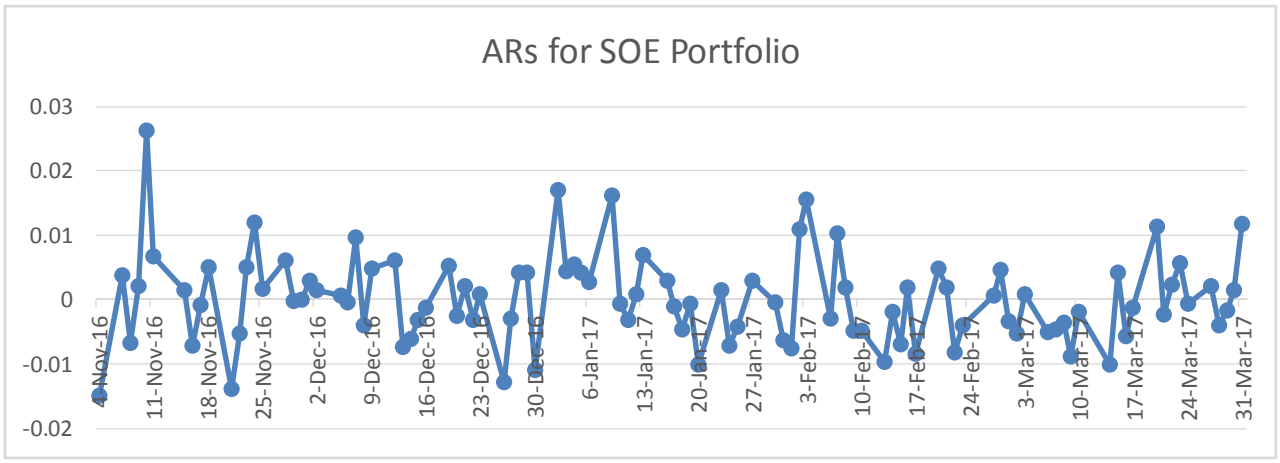
Note: This graph shows a scatterplot representing the mean CAR for each value of the Transparency International (2011) measure of corruption by sector. Higher values of this corruption index indicate lower levels of perceived corruption. Only the mean CAR is shown, as there are only a limited number of values taken by the index. The line of best fit is, however, computed using all of the CARs (as opposed to just the mean CARs for each index value). CARs are computed using the market model, and are Winsorized at 5%.

Figure 2: Abnormal Returns for the Portfolio of Banks



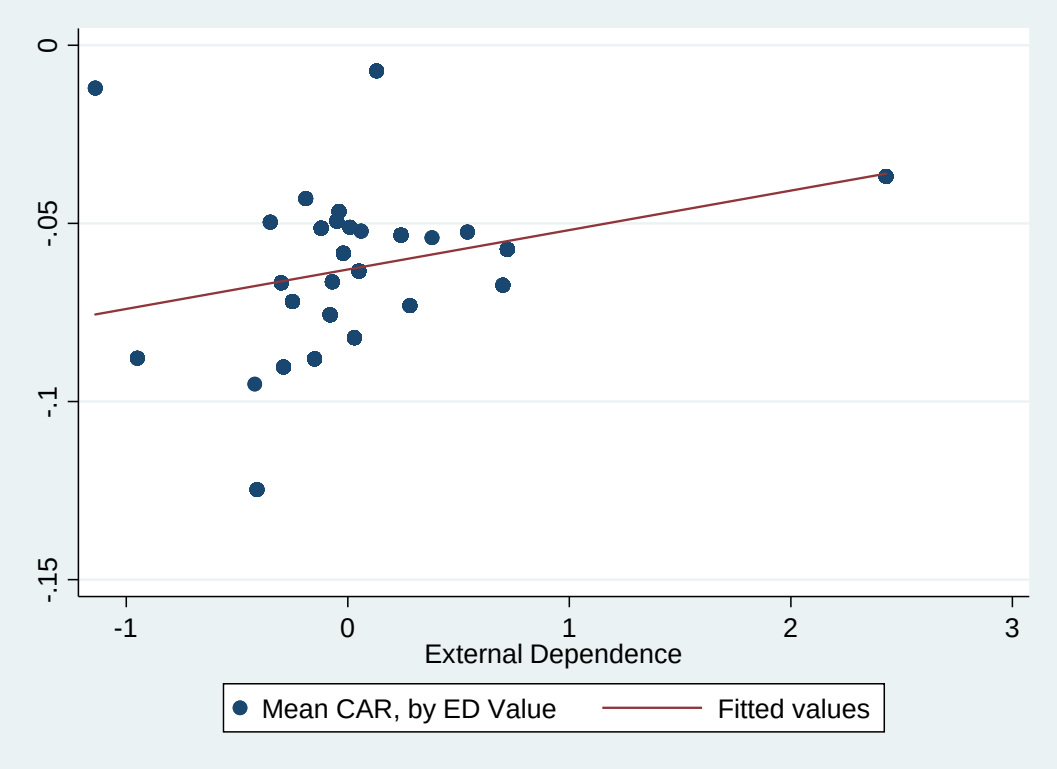
Note: This figure shows the abnormal returns within the (-3, +3) event window and the subsequent period up to March 31, 2017, for a portfolio consisting of all the banks in our sample.

Figure 3: Abnormal Returns for the Portfolio of State-Owned Firms (SOEs)



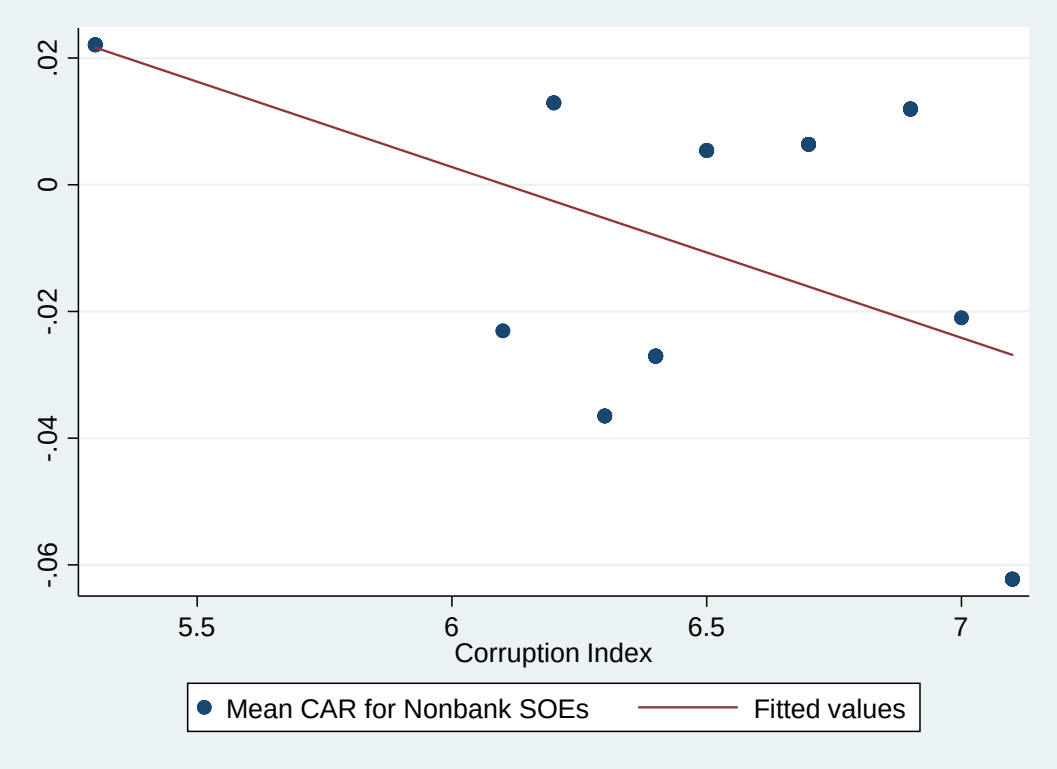
Note: This figure shows the abnormal returns within the (-3, +3) event window and the subsequent period up to March 31, 2017, for a portfolio consisting of all the SOEs in our sample.

Figure 4: Stock Market Reactions and External Financial Dependence by Sector



Note: This graph shows a scatterplot representing the mean CAR for each value of the external financial dependence measure from Kroszner et al. (2007), which represents an updated version of the Rajan and Zingales (1998) measure. The external dependence measure is constructed by International Standard Industrial Classification (ISIC) code for manufacturing industries. The ISIC codes are matched to the 5-digit National Industrial Classification (NIC) codes in Prowess using the concordance in Sivadasan (2009). Only the mean CAR is shown, as there are only a limited number of values taken by the index. The line of best fit is, however, computed using all of the CARs (as opposed to just the mean CARs for each index value). CARs are computed using the market model, and are Winsorized at 5%.

Figure 5: Stock Market Reactions and the Transparency International Measure of Corruption for Nonbank State-Owned Enterprises (SOEs)



Note: This graph shows a scatterplot representing the mean CAR for nonbank SOEs, for each value of the Transparency International (2011) measure of corruption by sector. Higher values of this corruption index indicate lower levels of perceived corruption. Only the mean CAR is shown, as there are only a limited number of values taken by the index. The line of best fit is, however, computed using all of the CARs (as opposed to just the mean CARs for each index value). CARs are computed using the market model, and are Winsorized at 5%.