The Value of Commitment: Evidence from Retrospective Taxation*

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Abstract

Fiscal policy is vulnerable to the classic problem of time inconsistency: governments can exploit sunk investments by reversing prior commitments. We study this problem using India's 2012 retrospective tax amendment, which retroactively imposed capital gains taxes on offshore transactions despite a prior Supreme Court ruling. Using firm-level data and a difference-in-differences design, we show that foreign investors withdrew from Indian firms and that investment contracted sharply in foreign-exposed firms. The magnitude of this response cannot be explained by the direct tax burden and instead reflects a credibility shock. We rule out generalized tax uncertainty and coincident global shocks as alternative explanations. Estimating a dynamic general equilibrium model disciplined by the reduced-form evidence and Indian macro-fiscal data, we find consumption-equivalent welfare losses of roughly three percent, arising primarily from the expectation of discretionary intervention. These findings provide the first direct evidence on the costs of discretionary fiscal policy, linking a canonical theoretical problem to real-world outcomes.

JEL Codes: E61, E62, H32, F21

Keywords: Policy credibility, time inconsistency, retrospective taxation

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1 Introduction

Policy reversals are a recurring feature of public policy and often carry severe consequences for long-term investment. In 2008, the United Kingdom introduced Budget Note 66, retrospectively invalidating offshore tax planning that had previously been legal. In Brazil, changes in environmental licensing and land-use rules have retroactively rescinded approvals, stranding capital and generating investor lawsuits (e.g., the Vale disputes in the Amazon). Venezuela's abrupt nationalizations of oil and mining assets in the 2000s imposed heavy ex post losses on investors who had entered under prior guarantees. Such reversals, whether in taxation, regulation, or property rights, erode the credibility of public policy and deter capital investment. In developing economies, where institutional checks are weaker, even a single reversal can cast a long shadow over future commitments (North and Weingast, 1989; Acemoglu et al., 2001; Azzimonti, 2018).

Identifying the economic cost of such credibility shocks is challenging because policy reversals typically coincide with broader macroeconomic or political disruptions. Against this backdrop, India's 2012 retrospective tax amendment—which overturned a Supreme Court ruling and imposed tax liabilities on past offshore transactions—offers a rare quasi-experimental setting to causally identify the real effects of an unanticipated breakdown in fiscal policy credibility.

Our analysis is rooted in the literature on the dynamic inconsistency of optimal policy, beginning with Kydland and Prescott (1977). Their seminal work highlights that a plan optimal at time t may not remain optimal at a later date $t' > t$. Kydland and Prescott (1980), Fischer (1980), and Chari and Kehoe (1990) apply this logic to capital taxation, showing that governments with discretionary authority may renege on promises once private agents have sunk investments, thereby inducing agents to underinvest ex ante in anticipation of such ex post expropriation. Commitment devices can improve welfare by limiting this time-inconsistency problem. Although most empirical applications of this framework have focused on monetary policy or sovereign debt, India's retrospective tax amendment provides an unusually sharp fiscal analogue, arguably closer to the canonical thought experiment than any prior real-world case. By combining reduced-form evidence with structural modeling, we directly link the theoretical logic of time inconsistency to observable consequences for foreign investment, firm capital investment, and welfare.

Vodafone acquired Hutchison Essar, an Indian telecom operator, indirectly in 2007 through an offshore transaction between its Dutch subsidiary and Hutchison's Cayman Islands entity. Later that year, India's tax authorities issued a notice to Vodafone for failing to withhold capital gains tax (CGT) on the deal, arguing that the underlying assets were located in India. Vodafone contested this demand, and in January 2012, the Supreme Court of India

ruled in its favor, holding that indirect transfers of Indian assets executed offshore were not taxable under the prevailing law. In response to this unfavorable ruling, the Government of India (GoI) amended the Income Tax Act in March 2012 to retroactively tax offshore transactions between non-Indian entities involving the indirect transfer of Indian assets, with effect from 1962. Unlike retrospective measures in advanced economies, which have been narrow in scope, publicly debated, and justified on administrative grounds,[1] India's policy reversed a clear judicial precedent and was enacted within two months of the Supreme Court judgment without public consultation. The amendment's sudden introduction, broad scope, and eventual repeal, therefore, provide a uniquely clean instance of a tax credibility shock. This shock is mirrored in external risk metrics: India's score on the contract viability indicator fell sharply following the 2012 amendment (Panel (a) in Figure 1). This index ranges from 0 to 4, with lower values indicating a higher risk of government modification of private contracts, especially those involving foreign-owned assets.[2]

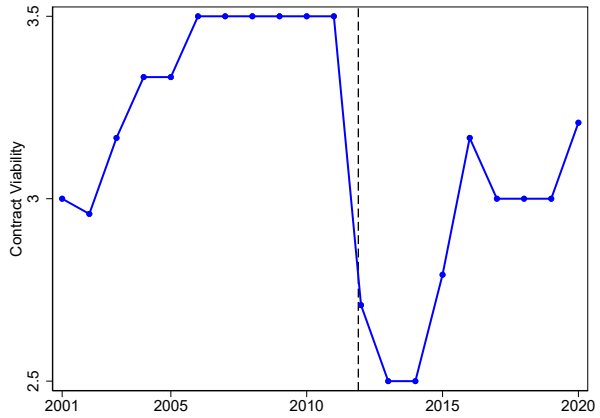
Our empirical analysis exploits this exogenous credibility shock to examine how tax discretion affects investment. We use firm-level ownership and balance-sheet data from the LSEG Refinitiv database for the period 2011–2013. Using a regression-discontinuity-in-time design, we first document a sharp decline in the share of foreign ownership in Indian firms immediately after the credibility shock. This decline is largest, around 3 percentage points, among firms with the highest pre-policy foreign investment, and the effect is persistent until the end of 2013. We next look at the impact on capital investment.

At the aggregate level, private capital investment as a share of GDP falls sharply beginning 2012 (Panel (b) in Figure 1), indicating a broad reversal in the pre-existing upward trend. To identify the causal effect of the retrospective tax amendment, we implement a difference-in-differences (DiD) design that compares pre- and post-policy changes in annual capital investment across firms with varying degrees of exposure to the shock, measured by their share of pre-policy foreign ownership. We find that firms with greater foreign exposure experience an economically and statistically significant contraction in capital investment following the policy announcement. For the average firm with an 18 percent foreign ownership share, capital investment declines by 44 percent. We find similar effects on the extensive

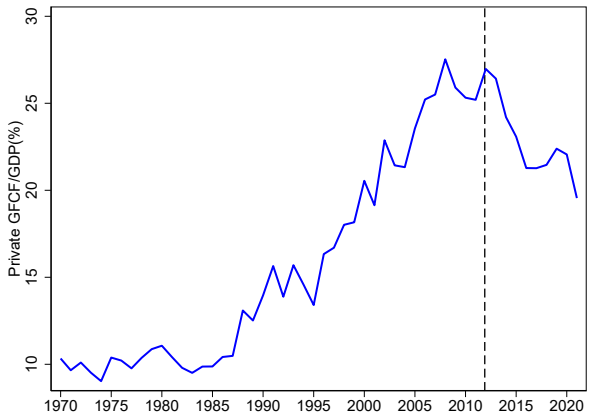
[1]For example, the U.S. Supreme Court upheld a limited retroactive estate tax provision in *United States v. Carlton* (1994), emphasizing its legitimate legislative purpose. Similarly, the United Kingdom's 2008 Budget Note 66 introduced a targeted measure against treaty-based avoidance. Both stand in sharp contrast to India's 2012 amendment, which applied retroactively for fifty years and overturned a Supreme Court ruling. Also, see Lunder et al. (2012) and Ortigueira and Pereira (2022) who discuss that in most cases retrospective changes hardly expand beyond the beginning of the year of enactment.

[2]The contract viability indicator is published by the PRS Group as part of its International Country Risk Guide. It is widely tracked by global investors as a measure of expropriation and contract-enforcement risk. Also see Azzimonti (2018).

Figure 1: Retrospective Tax Amendment: Dynamics of Contract Viability and Private Capex



(a) Contract Viability



(b) Private GFCF as a % of GDP (Current)

Notes: Panel (a) plots the contract viability—defined as the risk of unilateral contract modification or cancellation and, at worst, outright expropriation of foreign owned assets—from 2001–2020. The index ranges from 0–4, with lower values suggesting greater risk to foreign investment. Source: PRS Group. Panel (b) plots the gross private fixed capital formation (percent of GDP) from 1970–2020. The vertical line marks the 2012 retrospective tax amendment. Source: India Budget (2022-23), Economic Survey, Table 19.

margin, and the decline persists for up to three years after the policy. These baseline results remain robust to additional controls, alternative treatment definitions, sample restrictions, and outcome measures.[3]

The magnitude of the firm-level capital investment response is far too large to be explained by the direct tax burden of the policy. Relative to benchmark elasticities in the literature (Moon, 2022), our estimates imply an effect nearly an order of magnitude larger. This points to the credibility shock induced by the retrospective amendment, rather than the mechanical impact of a higher CGT, as the primary driver of the collapse in investment.

One possibility is that the observed contraction reflects a generalized deterioration in foreign investor sentiment. However, we provide evidence which is inconsistent with this interpretation. The effects are more concentrated among firms exposed to investors from tax havens, such as Mauritius, who could not offset Indian taxes through credits at home, whereas firms with predominantly domestic or treaty-protected foreign investors are far less affected. In practice, many cross-border investments had been deliberately structured through low- or no-capital-gains-tax jurisdictions under the prevailing legal framework, and widely regarded as consistent with international norms. The retrospective amendment effectively nullified such rule-compliant structures ex post, undermining confidence in the stability of India's tax regime. This heterogeneity underscores that the contraction was driven by the retrospective nullification of previously accepted tax arrangements, rather than by broad-based reassessment

[3]We also find that firms more exposed to the shock have lower revenue and assets, but employ more workers.

of India's investment climate.

A second possibility is that our results reflect generalized policy uncertainty or coincident global shocks. This interpretation is also inconsistent with the data. The aggregate index of economic policy uncertainty (EPU) for India (Baker et al., 2016) shows no spike around the time of the amendment and, in fact, declines one quarter after the shock, mirroring the global EPU trend. Empirically, our estimated effects remain stable after incorporating EPU controls in our regressions.[4]

We further validate our proposed mechanism using stock market reactions. Benchmark-adjusted returns of firms with greater foreign exposure are systematically lower following the amendment. This suggests an increase in the cost of capital, consistent with investors demanding higher hurdle rates to compensate for the risk of discretionary fiscal intervention. Equity markets thus provide forward-looking confirmation of the credibility channel: the retrospective tax shock tightened external financing conditions by raising required returns for more exposed firms.

Finally, we embed the reduced-form estimates in a dynamic general equilibrium framework to quantify the welfare costs of a credibility shock in fiscal policy. We extend the model in Chari and Kehoe (1990) to include foreign investment. The model is disciplined by Indian macro-fiscal aggregates and the empirically estimated contraction in capital investment following the retrospective tax amendment. The equilibrium allocations imply consumption-equivalent welfare losses of approximately three percent, arising primarily from the change in expectations about discretionary intervention. These results highlight that even in the absence of changes in fundamentals, a loss of policy credibility can generate sizable macroeconomic disruptions by depressing investment and long-run output.

Related Literature: The importance of policy commitment has been a central theme in macroeconomic theory since the seminal contribution of Kydland and Prescott (1977), who demonstrate that discretionary policymaking leads to time-inconsistency problems. Policymakers face incentives to deviate from previously announced policies once private agents have acted based on those commitments. The inability to credibly commit to future policy actions results in suboptimal economic outcomes as agents expect government deviation and plan accordingly.

[4]Another strand of literature documents the real economic costs associated with policy uncertainty, in areas such as tax (Bloom, 2009; Julio and Yook, 2012), trade (Handley and Limão, 2017), or immigration (Chaurey et al., 2024). In the context of tax-related uncertainty, the literature underscores the negative effects on investment, but defines uncertainty in terms of the complexity or unpredictability of the tax system, emphasizing random shocks and unclear rules. In contrast, we focus on a theoretically distinct channel: the economic costs arising from a failure to commit to past policies.

Although the theory of discretionary policymaking is well developed, empirical tests are relatively rare, particularly in the domain of fiscal policy. Most empirical studies focus either on monetary policy (Clarida et al., 2000; Bocola et al., 2025) or on sovereign debt crises, where incentives to default reveal commitment failures (see Tomz and Wright (2013) for a survey). Early work on retrospective taxation, most notably Eichengreen (1989), interpreted post-war capital levies as ad hoc responses to fiscal exigencies that unintentionally undermined future investment by signaling governments' willingness to expropriate accumulated wealth. These historical accounts documented the qualitative costs of lost credibility but lacked direct, micro-level evidence or a structural mapping to the canonical time-inconsistency framework. Our analysis advances this literature on two fronts. First, we exploit an exogenous, court-triggered reversal in tax policy that causally isolates the pure credibility channel from contemporaneous fiscal needs or macro shocks, providing, to our knowledge, the first causal estimate of the investment cost of tax policy discretion.[5] Second, by embedding our empirical estimates in a dynamic general equilibrium model, we quantify the welfare costs of such discretion.

Our work is also related to the taxation literature which shows that predictable changes in tax parameters can exert large effects on investment through changes in the user cost of capital. A large body of work evaluates the impact of tax rate changes on investment.[6] However, research on investor-level taxation, particularly differences arising from investors' tax residence, such as tax haven versus non-haven jurisdictions, is sparse.[7] Yagan (2015) finds little investment response to the 2003 U.S. dividend-tax cut, consistent with the "new-view" prediction that retained earnings finance marginal investment. By comparison, Moon (2022) provides evidence linking CGTs to real corporate investment, estimating an elasticity of roughly two with respect to the net-of-tax rate. We show that even with such high elasticity, the investment response is an order of magnitude smaller than that induced by a credibility loss.

2 Institutional Background

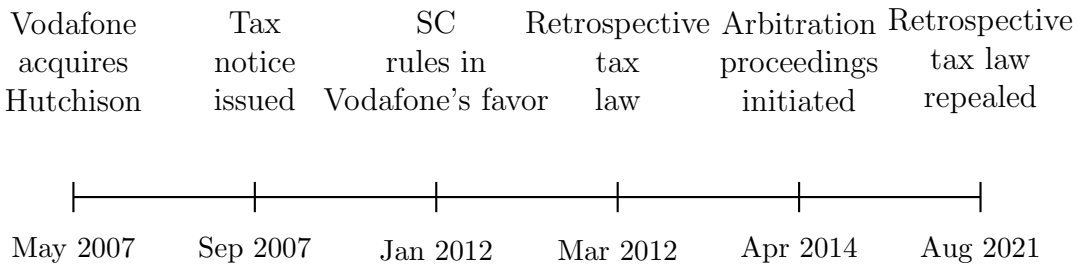
Like several major economies, India has a long history of retrospective tax amendments aimed at clarifying ambiguities, closing loopholes, or reaffirming legislative intent. In the

[5]Causal micro-level evidence on the dynamic inconsistency of optimal policy is virtually absent; even in the domains of monetary policy and sovereign debt, empirical analyses remain predominantly aggregate.

[6]Early studies such as Summers (1981), Auerbach and Hassett (1992), and Cummins et al. (1996) show that reductions in corporate or investment taxes raise investment, though elasticities vary widely across settings. Subsequent work exploiting specific policy reforms–such as the U.S. investment tax credit and bonus depreciation episodes (Goolsbee, 1998; House and Shapiro, 2008; Zwick and Mahon, 2017) or production-based incentives in other countries (Ohrn, 2018; Liu and Mao, 2019; Maffini et al., 2019)–confirms substantial responsiveness of firm-level capital formation to effective tax rate changes.

[7]Data limitations have long constrained our understanding of how multinational firms use tax havens for profit shifting. Recent work, such as Tørsløv et al. (2023), helps to address some of these challenges.

Figure 2: Timeline of Key Events Surrounding the 2012 Retrospective Tax Amendment



Notes: The figure gives the timeline of key events leading to and after the 2012 retrospective tax amendment. In May 2007, Vodafone International Holdings acquired a 67 percent stake in Hutchison Essar Ltd. through an offshore transaction valued at approximately $11.2 billion. Subsequently, in September 2007, the Indian Income Tax Department issued a notice to Vodafone, asserting that the company was liable to withhold tax (around 2.2 billion USD) at source under Section 195 of the Income Tax Act. In 2008, the Bombay High Court upheld the tax department's position and ruled against Vodafone. Vodafone appealed the decision, and in January 2012, the Supreme Court of India ruled in Vodafone's favor, holding that the transaction, being between two non-Indian entities and executed outside India, was not subject to Indian taxation. In response, the GoI enacted a retrospective amendment to the Income Tax Act in March 2012, permitting the taxation of indirect transfers of Indian assets dating back to 1962. In April 2014, Vodafone initiated arbitration proceedings under the India–Netherlands Bilateral Investment Treaty, alleging that the retrospective tax demand violated protections under the treaty. In September 2020, the Permanent Court of Arbitration at The Hague ruled in favor of Vodafone, stating that India's retrospective tax demand breached the fair and equitable treatment clause of the treaty. Finally, in August 2021, the Indian Parliament passed legislation repealing the retrospective tax provision and offered refunds, contingent upon the withdrawal of all related legal proceedings by the affected companies.

early decades after Indian independence, such amendments primarily applied to indirect taxes like excise and customs duties. Courts generally upheld them as necessary for administrative efficiency (Salve, 2009). The 2012 retrospective tax amendment in response to the Vodafone case, however, was unprecedented in both scope and intent.

Figure 2 presents the chronology of key events. In 2007, Vodafone International Holdings BV, a Dutch subsidiary of Vodafone, acquired CGP Investments (Holdings) Ltd., a Cayman Islands company, from Hutchison Telecommunications International Limited. This transaction effectively transferred a 67% controlling interest in Hutchison Essar Limited (HEL), an Indian telecom operator, to Vodafone in September 2007. The Indian tax authorities claimed Vodafone was liable to withhold tax (USD 2.2 billion) on this transaction, arguing that it constituted transfer of underlying Indian assets. Vodafone contested this claim, asserting that the deal occurred between two foreign entities and thus fell outside Indian tax jurisdiction.

The case was litigated across multiple courts and eventually reached the Supreme Court of India, which, on January 20, 2012, ruled in Vodafone's favor. The Supreme Court upheld that Indian tax authorities had no jurisdiction to tax an offshore transaction between non-resident entities, stating that:

"*the transaction in question is a structured FDI investment into India which fell outside India's territorial tax jurisdiction, hence not taxable.*" (Supreme Court of India, 2012)

In response, the Indian government swiftly introduced a retrospective amendment to the Income Tax Act in March 2012. The amendment clarified that transfers of shares in foreign entities deriving substantial value from assets in India would be subject to Indian capital gains tax, with effect from April 1, 1962.[8] It effectively overturned the Supreme Court's ruling by retrospectively bringing indirect offshore transfers within the ambit of Indian taxation. According to the memorandum accompanying the Finance Bill, 2012, the amendment was intended to:

"*clarify that an asset or a capital asset being any share or interest in a company or entity registered or incorporated outside India shall be deemed to be and shall always be deemed to have been situated in India, if the share or interest derives, directly or indirectly, its value substantially from the assets located in India.*" (Government of India, 2012)

Unlike past retrospective tax amendments, which primarily clarified ambiguities or addressed tax avoidance, this amendment imposed an entirely new tax liability rather than closing a loophole. Historically, such amendments covered recent years to preserve the integrity of the tax system. In contrast, the 2012 amendment had a retrospective reach of over 50 years. Moreover, the law remained vague on interpretation, referring only to cases where *a share derives its value substantially* from Indian assets without defining any threshold. This quantitative threshold was clarified much later in May 2016.[9]

The market reaction was immediate, leading to a general loss of investor confidence. Amid concerns within the ruling government, in July 2012, the government appointed the Shome Committee to review the amendment. Although the Committee's recommendations were not implemented, it concluded that the Vodafone-Hutchison transaction was commercially motivated rather than about tax avoidance and characterized the retrospective law as excessive. The committee noted:

"*that retrospective application of tax law should occur in exceptional or rarest of rare cases, and with particular objectives: first, to correct apparent mistakes/anomalies in the statute; second, to apply to matters that are genuinely clarificatory in nature, i.e. to remove technical defects, particularly in procedure, which have vitiated the substantive law; or, third, to protect*

[8]In May 2012, the Central Board of Direct Taxes (CBDT) issued a clarificatory statement to address investor concerns. The CBDT clarified that assessments already finalized as of April 1, 2012 would not be reopened solely on the basis of these new provisions. This clarification provided a degree of certainty for taxpayers with fully closed cases, but it offered limited protection: the retrospective rules could still be applied to any pending assessments, ongoing appeals, or cases where the statutory time limit for reassessment had not yet expired, effectively preserving broad discretion for tax authorities.

[9]The share or interest is considered to derive its value substantially from India if the market value of the assets located in India exceeds INR 100 Million (USD 1.5 million), and constitutes at least 50 percent of the total assets of the company or entity (see PwC Report).

the tax base from highly abusive tax planning schemes that have the main purpose of avoiding tax, without economic substance." (BIICL)

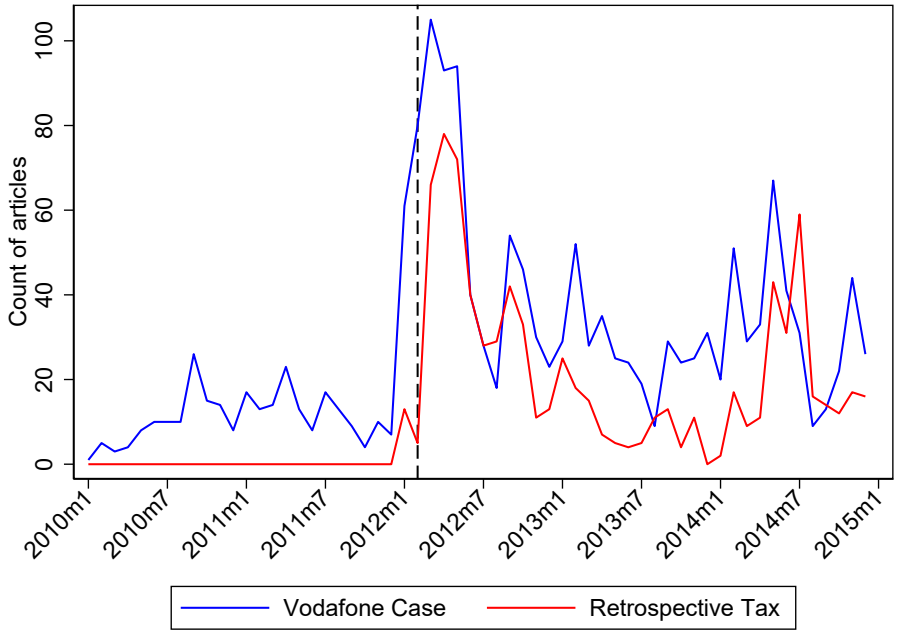
International arbitration rulings ultimately played a decisive role in prompting the repeal of India's retrospective taxation provisions in August 2021. While earlier retrospective tax measures were largely accepted following judicial scrutiny, the 2012 amendment faced extensive external legal challenges. Vodafone and Cairn Energy initiated arbitration proceedings under bilateral investment treaties with the Netherlands and the United Kingdom, respectively. These disputes marked the first time a retrospective tax law was contested through international arbitration. In 2020, the Permanent Court of Arbitration in *Vodafone International Holdings B.V. v. Government of India* held that India had breached the India–Netherlands investment treaty (ITAlaw, 2020), while a similar tribunal in *Cairn Energy PLC v. Government of India* found a violation of the United Kingdom–India Bilateral Investment Treaty and ordered New Delhi to pay approximately $1.4 billion in damages (Permanent Court of Arbitration, 2020). Following the Cairn award, U.S. courts allowed enforcement actions against Indian state-owned assets, including proceedings that treated Air India as legally indistinct from the Indian state, thereby permitting the potential seizure of its aircraft to satisfy the arbitral award (U.S. District Court, S.D.N.Y., 2021; Stempel, 2021).

Was the retrospective tax anticipated? To test whether this policy was anticipated, we collect news articles from major business newspapers for 2010-2014 using Factiva, focusing on coverage of the Vodafone case and retrospective taxation. We use a large language model for further classification of articles covering these two topics (see Appendix B for details). Figure 3 shows the timeseries of coverage of these two topics. While the Vodafone case attracted sustained attention during this entire period, there is no evidence for public discussion or anticipation of retrospective taxation prior to the March 2012 tax amendment.

In general, retrospective tax measures are typically debated or announced before implementation. For instance, in the United Kingdom, the Finance Act 2008 introduced a retrospective amendment to close a tax avoidance loophole only after extensive public consultation and prior announcements by HM Treasury. By contrast, the sudden introduction of the 2012 Indian amendment, without consultation or advance discussion, constitutes an unanticipated policy shock, providing a sharp natural experiment for evaluating the impact of tax discretion.

To summarize, two features of this amendment are particularly useful for our empirical strategy. First, it was completely unanticipated, providing a plausibly exogenous shock on retrospective taxation. Second, it marked a clear departure from established tax practice, targeting genuine cross-border transactions rather than closing narrowly defined tax-avoidance

Figure 3: Media Coverage of Vodafone Tax case and Retrospective Tax



Notes: This figure shows the count of newspaper articles around the topic of Vodafone case (Blue) and Retrospective Tax in India, announced in Mar 2012 annual budget (Red). These articles are sourced from the Factiva database for the time–period January 2010–December 2014. The vertical line corresponds to March 2012, the month of retrospective tax amendment. The process of data collection and classification of these articles is explained in section B.

loopholes. In fact, the amendment constituted an exogenous loss of policy commitment immediately following a judicial affirmation of the rule of law. This sequence captures the mechanism emphasized in Kydland and Prescott (1977), where discretionary reversals undermine the credibility of established policy rules.

3 Data

We use the LSEG Refinitiv dataset that provides comprehensive information on the principal shareholders of publicly listed companies in India. Shareholders are classified by type—such as institutional, strategic, or brokerage—and, crucially, by country of origin. This feature allows us to compute the foreign ownership share of each firm, defined as the sum of the equity holdings of all non-Indian entities, measured at a quarterly frequency.

For our foreign ownership analyses (2011–2013), we use firms that have a non-zero foreign ownership in the period prior to the retrospective tax amendment. This yields a sample of $1,133$ firms, which exhibit an average foreign shareholding of 17.6 percent in 2011Q4.[10] Despite representing only a subset of all firms, those with positive foreign ownership account

[10]There are 3,090 firms in the whole sample, out of which 1,934 firms (62.5%) have no foreign ownership during the period of our analyses.

for 96.9 percent of total investment in the economy, underscoring their macroeconomic importance.

Our main variable of interest, firm-level capital expenditure, also comes from the LSEG Refinitiv dataset. The data further include annual information on other firm-level outcomes such as revenue, assets, and debt. The unique firm identifier enables us to merge these outcomes with the foreign ownership data, resulting in an annual firm-level panel covering financial years 2009–10 through 2013–14. Summary statistics for the main variables are presented in Table 1. Given the high inflation over this period, the modest rise in nominal capital expenditure suggests little to no real increase in investment between the pre- and post-policy periods.

Table 1: Summary Statistics: LSEG Data

	Pre-Policy			Post-Policy		
	Mean	SD	Max	Mean	SD	Max
Capital Expenditure	4.09	19.78	350.31	4.68	25.71	615.65
Revenue	31.24	147.43	3097.96	46.06	234.8	4883.45
Total Assets	91.34	574.98	16478.98	130.94	801.05	23964.95
Total Debt	20.2	89.55	1690.34	31.88	136.52	2473.2
Full-time Employees	2697.41	14179.46	383347	3240.66	17012.66	371546

Notes: This table provides the summary statistics on the firms present in the LSEG Refinitiv dataset. We focus on firms with non-zero share of foreign ownership in the pre-period. Data are from the LSEG Annual Balance Sheet (FY 2009–10 till FY 2013–14), at the Firm × Year level. Capital expenditure refers to the funds used by a company to acquire, upgrade, or maintain physical assets such as property, plants, or equipment. Revenue refers to the total value of receipts from sales of products and services. Total assets represents the total current and non-current assets reported by the firm. Total Debt refers to the sum of long-term and short-term borrowings of the firm. These variables are reported in nominal terms and are denominated in INR billions. The sample comprises 1,133 firms.

4 Impact of Tax Discretion on Foreign Investment

As discussed in Section 2, the retrospective taxation introduced in early 2012 undermined confidence in the stability and credibility of India's tax policy regime, particularly among foreign investors. If the policy has a deterrent effect, we would expect to observe a contraction in foreign equity holdings in the period following the announcement. To empirically assess this hypothesis, we analyze the impact on firm-level foreign ownership using the following empirical specification:

$$ForeignShare_{it} = \beta_0 + \beta_1 \times Post_t + \delta_i + \epsilon_{it}, \tag{1}$$

where $ForeignShare_{it}$ denotes the equity share of foreigners in firm i in quarter t. The indicator $Post_t$ equals one for quarters after the credibility shock (April 2012–December 2013), and zero otherwise. We include firm fixed effects δ_i to absorb time-invariant unobserved

firm heterogeneity. This specification is akin to a Regression Discontinuity (RD) design in time, comparing foreign equity share at the firm-level before and after the shock within a narrow time window.

Table 2 presents the estimation results. We focus on the sample of firms which reported non-zero foreign equity share prior to the credibility shock in December 2011. In column (1), the coefficient on post period dummy is -0.68 and statistically significant, indicating a 68 basis-point decline in the foreign equity share following the shock. Given an average pre-shock foreign share of 17.1 percent, this corresponds to roughly a four percent reduction in foreign investors' holdings.

Table 2: Impact of Retrospective Tax on Foreign Equity Share

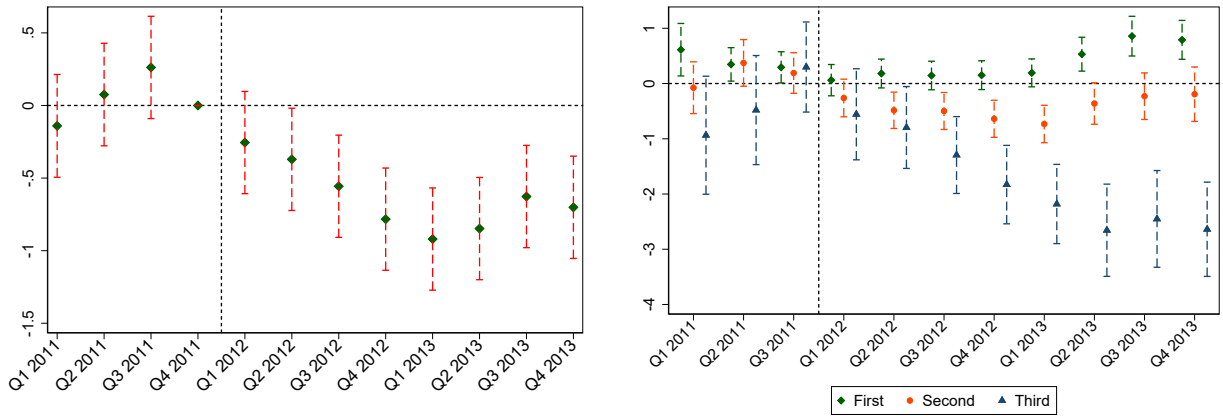
	(1)	(2)	(3)
Post	–0.686***	–0.365***	–0.355***
	(0.085)	(0.125)	(0.101)
Observations	13819	13579	13579
R-Squared	0.96	0.96	0.98
Mean	17.52	17.53	17.53
Firm FE	Yes	Yes	Yes
Sector × Time Trend	No	Yes	Yes
Firm × Time Trend	No	No	Yes
Firms	1155	1135	1135

Notes: The dependent variable in columns (1)–(3) is foreign equity share in a given firm. Data are from the LSEG Ownership Data (January 2011–December 2013) at the Firm × Quarter level. The results are based on estimating the Equation 1. The Post dummy equals 1 for period January 2012–December 2013; and 0 otherwise. Standard errors are robust. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In subsequent columns, we incrementally add controls to examine the robustness of this result. Column (2) incorporates sector-specific linear time trends to absorb common shocks affecting foreign investment within industries. Similarly, column (3) includes firm-specific linear time trends to account for heterogeneous pre-existing dynamics at firm level. Across all specifications, the coefficient on $Post_t$ remains negative and significant, indicating that the estimated decline is robust to alternative controls for time-varying dynamics.

We next implement an event study specification to estimate the quarterly dynamics of foreign equity holdings around the retrospective tax announcement. We modify Equation 1 to include a series of quarterly indicators instead of $Post_t$ in our regression with October–December 2011, the quarter immediately preceding the shock, serving as the baseline period. The results in Figure 4a reveal no differential pre-trends in foreign equity holdings prior to the announcement, consistent with the identifying assumption of policy exogeneity. Beginning in the first quarter of 2012, foreign ownership declines significantly and remains below pre-shock

Figure 4: Impact of Retrospective Tax on Foreign Ownership



(a) Dynamics: All Firms

(b) Dynamics: By Initial Ownership Tercile

Notes: The dependent variable is foreign equity share in a firm. Data are from the LSEG Ownership Data (January 2011–December 2013), at the Firm × Quarter level. Both panels show coefficient estimates where the x-axis reports month dummies and the y-axis captures changes in foreign ownership share relative to the 2011Q4 baseline. In Panel (a), we plot the aggregate dynamics for all firms. In Panel (b), firms are divided into terciles based on their 2011Q4 foreign equity share: (green) below 4.78% (bottom tercile), (orange) 4.78–15.61% (middle), and (blue) above 15.61% (top). Standard errors are robust.

levels through the end of 2013. This pattern indicates a persistent contraction in foreign investment following the tax amendment.

We next examine heterogeneity in the credibility shock's impact across firms as a function of their pre-policy levels of foreign ownership. Given that the legislation primarily targeted firms with substantial foreign ownership, we expect a more pronounced decline in foreign ownership among these firms. To explore this, we partition firms into terciles based on their share of foreign ownership prior to the shock. Figure 4b presents the results. The foreign ownership decline is most pronounced among firms in the top tercile: which witness an immediate and persistent decline in foreign ownership, amounting to a 3 percentage points reduction by the end of 2013. Firms in the middle tercile exhibit a modest but short-lived decline in foreign ownership. Finally, firms in the bottom tercile show no measurable change in foreign ownership after the shock.

We also assess the heterogeneous responses across different types of foreign investors in Appendix Table A.1. The outcome variable is the foreign ownership share held by a given investor type, foreign corporations (column (1)), foreign holding companies (column (2)), foreign hedge funds (column (3)), and sovereign wealth funds (column (4)). Ownership declines across all investor categories following the credibility shock. While the retrospective tax amendment primarily targeted foreign firms with substantial ownership stakes, these results indicate a broad-based withdrawal by all foreign investor groups.

Tax Repeal in 2021: Finally, we ask whether reversing the retrospective policy mitigated investor concerns about India. Specifically, we examine whether foreign investors increase their ownership following the August 2021 repeal of the retrospective tax. Event-study estimates (Appendix Figure A.1) show no discernible change in the foreign ownership around the repeal window, indicating that the policy reversal does not restore investor confidence in India's tax regime. These findings suggest that once credibility is eroded, subsequent policy reversals may be insufficient to restore it.

Overall, our findings reveal a strong response from foreign investors, underscoring the adverse effect of the retrospective tax policy on foreign participation in Indian firms.

5 Firm Response to Tax Discretion

The introduction of retrospective taxes can significantly alter investors' perceptions of the government's commitment to previously announced tax policies. Initially, governments may signal their dedication to fostering an investor-friendly environment by offering low capital tax rates. However, once substantial investments have been made and capital becomes relatively immobile, governments may be incentivized to introduce retrospective taxes in an attempt to capture a larger share of the returns. Upon the enactment of such a tax law, rational investors update their expectations, recognizing that future policy reversals are likely once investments are sunk and exit costs increase. Consequently, even initially favorable conditions would fail to stimulate investment if investors anticipate ex-post appropriation of returns.

5.1 Empirical Strategy

Our empirical strategy seeks to test the above hypothesis by investigating whether firms with greater exposure to the shock experience a more pronounced decline in capital investment following the 2012 retrospective tax amendment. We define firm-level exposure using each firm's foreign equity share as of December 2011, prior to the announcement. This pre-period measure, $ForeignShare_{i,pre}$, follows the treatment-intensity approach used by Clemens et al. (2018) and Chakrabarti et al. (2025). Results from the previous section further validate this measure as firms with higher pre-shock foreign ownership experience larger declines in foreign equity share, confirming that $ForeignShare_{i,pre}$ effectively captures exposure to the shock.[11]

To estimate the impact of the credibility shock on capital investment, we use the following empirical specification:

$$y_{it} = \mu_0 + \mu_1 Post_t + \mu_2 \left[Post_t \times ForeignShare_{i,pre}\right] + \gamma_i + \epsilon_{it}, \tag{2}$$

where y_{it} denotes firm-level annual investment, measured either as (i) the logarithm of capital

[11]Appendix Figure A.2 plots the distribution of $ForeignShare_{i,pre}$.

expenditure (intensive margin) or (ii) a binary indicator equal to one if the firm undertakes capital expenditure in a given year, otherwise zero (extensive margin). The variable $Post_t$ is a dummy equal to one for fiscal years 2012 to 2014, representing the post-shock period.[12] Firm fixed effects, γ_i, control for time-invariant firm characteristics. This setup corresponds to a difference-in-differences framework, where treatment intensity varies continuously with a firm's pre-shock foreign ownership, $ForeignShare_{i,pre}$. Our main coefficient of interest, μ_2, captures the differential post-shock response in investment across firms with varying levels of foreign exposure. Since, firms with non-zero foreign equity are very different from those without any foreign investment, we restrict our sample to firms with nonzero foreign equity share in the pre-policy period. Standard errors are clustered at the firm level and we winsorize y_{it} at the 1% level. We also show that results are robust to alternative continuous-treatment estimators following Callaway et al. (2024).

5.2 Impact on Capital Investment

Table 3 presents the results. We find that firms with higher foreign ownership experienced a statistically significant reduction in capital expenditure following the credibility shock (column (1)). The interaction term $\mathbb{1}(Post_t) \times ForeignShare_{i,pre}$ has negative and significant coefficient, with point estimates -0.025. For the average firm, this translates into a 43.9 ($=17.57\times0.025$) percent decline in investment after the shock. The results remain robust to including a battery of controls like year fixed effects (column (2)), and year $\times$ sector fixed effects (column (3)) to account for sectoral variation over time. The coefficient estimates in these two specifications remain similar, reinforcing the stability of the main result.

The elasticity of investment is substantially larger, by nearly an order of magnitude, than the elasticity of investment with respect to capital gains tax reported in the literature. Moon (2022) estimates the elasticity of investment with respect to the net-of-tax rate to be 2, which lies on the higher end of values reported in the literature (see, for instance, Yagan (2015)). Foreign investment (defined as the sum of FDI and portfolio inflows) accounts for approximately 10% of total investment in India. If the CGT on foreign investors increases from 0% to 20%, then the net-of-tax rate falls from 1 to 0.8, implying a change in foreign investment of $2 \times \frac{0.8-1}{1} \times 0.1 = -0.04$. Therefore, even under a high elasticity assumption, the implied decline in total investment would be about 4 percent. This effect would be even smaller if investors attach a positive probability to the tax not being enforced.[13] In contrast, our main experiment estimates a 44 percent drop in investment, suggesting that nearly all of

[12]Data on capital expenditures are reported at an annual frequency. The Indian fiscal year runs from April to March.

[13]Many investors may already be subject to capital gains taxation in their home countries, and under India's Double Tax Avoidance Agreements (DTAAs), their effective tax liability may therefore not change much. See Section 6.1 for further discussion.

Table 3: Impact of Retrospective Tax on Investment

	Investment			Investment Dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
Post	0.544**			0.025**		
	(0.241)			(0.010)		
Post × Foreign Share	–0.025**	–0.025**	–0.026**	–0.001**	–0.001**	–0.001**
	(0.011)	(0.011)	(0.012)	(0.000)	(0.000)	(0.000)
Observations	5607	5607	5499	5607	5607	5499
R-Squared	0.75	0.75	0.76	0.71	0.71	0.72
Mean	15.94	15.94	16.11	0.84	0.84	0.85
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	No	Yes	Yes
Sector FE	No	No	Yes	No	No	Yes
Year × Sector FE	No	No	Yes	No	No	Yes
Firms	1133	1133	1111	1133	1133	1111

Notes: The dependent variable in columns (1)–(3) is the log of capital expenditure by the firm in given year. In columns (4)–(6), the dependent variable is a dummy equal to 1 if a firm has non-zero capital expenditure, else zero. Data are from the LSEG Annual Balance Sheet (FY 2009–10 till FY 2013–14), at the Firm × Year level. The results are based on estimating Equation 2. The Post dummy equals 1 for FY 2012-14 and 0 otherwise. Foreign Share is a continuous treatment variable denoting a firm's foreign equity as on December 2011. Standard errors clustered at the firm level. *** p < 0.01, ** p < 0.05, * p < 0.1.

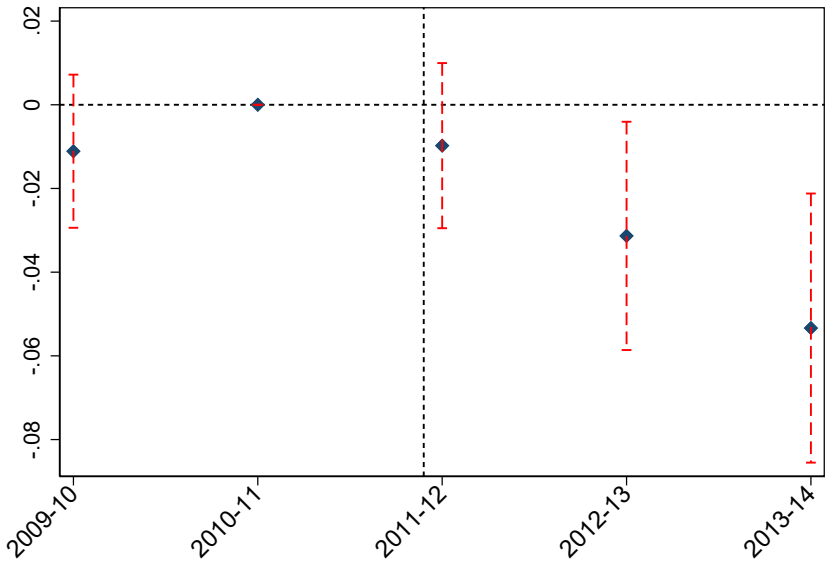
the decline is driven by the credibility shock, and not the direct effect of the increased tax burden.

Columns (4)–(6) examine the impact of the shock on firms' binary investment decisions, i.e., the extensive margin. Across all specifications, the results indicate a decline in the likelihood of investment, as evidenced by the negative and statistically significant interaction term coefficients. The average firm is 0.017 (=17.57 × 0.001) percentage points less likely to invest in the post-shock period. This represents a 2 percent decline over the pre-period investment probability of 0.85.

Next, we verify that our results are not driven by pre-existing trends in firms' investment behavior based on their level of foreign ownership. Figure 5 presents an event study using 2011 as the base year. The estimates show that the credibility shock results in a decline in firm-level investment in the years following the introduction of the retrospective tax, with effects persisting through 2014. Importantly, there is no evidence of pre-trends prior to the policy change. Detailed estimates for all specifications, both investment and investment dummy, are reported in the Appendix Table A.2, which confirm these results.

Controlling for Other Firm Characteristics: We further assess whether other pre-existing firm characteristics can explain the observed decline in investment following the shock. These characteristics may plausibly influence both a firm's level of foreign ownership and its investment dynamics. To address this concern, we augment our baseline specification

Figure 5: Impact of Retrospective Tax on Firm Investment: Event Study



Notes: The dependent variable is the log of capital expenditure by a firm in a given year. Data are from the LSEG Annual Balance Sheet (FY 2009–10 till FY 2013–14), at the Firm × Year level. This is an event-study where the y-axis captures the difference in capital expenditure baselining 2011Q4 as a function of foreign share. Foreign Share is a continuous treatment denoting the share of foreign ownership in firms as of 2011Q4. The vertical dashed line corresponds to the retrospective tax amendment in March 2012. Standard Errors are clustered at the firm-level. The Indian financial year runs from April to March.

by interacting each firm-level characteristic with the post-policy indicator, thereby allowing for time-varying effects. Appendix Table A.3 presents the results, sequentially controlling for firm size and leverage. Across all specifications, the coefficient on $Post_t \times ForeignShare_{i,pre}$ remains negative, statistically significant, and similar in magnitude to the baseline estimate, suggesting that pre-period foreign ownership continues to explain the observed decline in capital investment after the retrospective tax.

5.3 Robustness

Quartile Treatment: Appendix Table A.4 presents results using a quartile-based treatment specification, instead of continuous treatment (Callaway et al., 2024), where firms are categorized into four quartiles according to their foreign ownership share. Consistent with main specification, the decline in investment is more pronounced among firms with high foreign ownership.

Domestic vs. Foreign Ownership: Our baseline analysis focuses on firms with non-zero foreign ownership prior to the policy change, as comparing firms with and without any foreign ownership may introduce bias due to fundamental differences between the two groups. Nonetheless, we examine this broader comparison across firms with and without foreign

ownership in Appendix Table A.5. We find that both the investment and the probability of investment decline only among firms with non-zero share of foreign ownership.

Alternative Outcome Variable: The results also remain robust when using the inverse hyperbolic sine (IHS) transformation of investment instead of the log transformation as the outcome variable, as shown in Appendix Table A.6.

Overall, our results underscore the broader economic consequences of the credibility shock. The retrospective tax announcement constrained firm-level capital investment, potentially dampening long term growth and productivity.

5.4 Impact on Other Firm Outcomes

Next, we examine how the credibility shock affected other firm-level outcomes. Using the most saturated specification outlined in Equation 2, we estimate the impact on other outcomes and report the results in Appendix Table A.7. Column (1) presents the impact on firm revenues. Firms with higher levels of foreign ownership prior to 2012 experience a decline in revenue following the policy announcement. A one-standard-deviation increase in foreign ownership leads to a revenue decline of 38 percentage points. More exposed firms also reduce their total assets in response to the shock (column (2)). In contrast, columns (3)–(4) indicate no significant change in leverage or debt in the post-policy period. Finally, we see some increase in the count of employees (column (5)) by these firms, suggesting a substitution of capital with labor.

6 Mechanism

6.1 Role of No Capital Gains Tax Jurisdictions

India has Double Tax Avoidance Agreements (DTAAs) with many countries, under which foreign residents are entitled to claim a credit in their home jurisdiction for taxes paid in India. This arrangement allows investors in such jurisdictions to offset at least part of their home tax liability with Indian taxes, thereby reducing, though not fully eliminating, the risk of double taxation. As a result, the retrospective amendment would disproportionately affect investors from jurisdictions without capital gains taxation, or tax havens (henceforth). Because these investors faced no home-country capital gains tax liability, they are unable to offset the unexpected Indian levy through foreign tax credits.

In practice, many cross-border investments had been deliberately structured through low- or no-capital-gains-tax jurisdictions to minimize exposure to Indian taxation under the prevailing legal framework. These arrangements were typically vetted by legal and tax advisors and widely regarded as consistent with existing international tax norms. The retrospective

amendment effectively nullified such structures ex post, undermining the credibility of the tax regime. Numerous cross-border investments, for instance, had been routed through Mauritius and similar jurisdictions precisely to take advantage of the India-Mauritius DTAA. After the tax amendment, the BlackRock prospectus explicitly cautioned:

"*Numerous investors have relied on the benefits of the DTAA to invest in India through Mauritius in the past ... However, recently issued rulings suggest that the Indian tax administration's analysis may have changed, and that the tax authorities may now focus on a number of factors when assessing whether a foreign entity is eligible for the benefit of the provisions of a tax treaty, including, among others, the place of management of the foreign resident company and the level of substance in the jurisdiction in which it is incorporated.*" (BlackRock, Inc., 2012)

This contemporaneous disclosure illustrates how the retrospective amendment was viewed by market participants as a fundamental shift in policy credibility rather than simply a tightening of tax enforcement. We, therefore, expect investors from tax haven jurisdictions to be more likely to liquidate their equity positions in India following the amendment, thereby leading to a decline in capital investment by firms with greater exposure to such investors. By contrast, investments originating in countries that levy capital gains taxes and maintain DTAAs with India are relatively insulated from the shock.

To test this hypothesis, we define tax havens as countries with zero corporate or individual capital gains tax rates (Source: PwC).[14] We first check if the share of equity investment from tax haven countries declines after the retrospective tax. In the pre-shock period, firms had an average of 5.0 percent ownership from tax haven countries, relative to 17.7 percent ownership from all foreign investors. Appendix Figure A.3 shows the persistent decline in the tax haven share, similar to the baseline results seen for overall foreign share in Figure 4a.

For the impact on capital investment, we begin with a specification that interacts the post-amendment dummy with the firm's share of ownership from tax haven countries:

$$y_{it} = \mu_0 + \mu_1 Post_t + \mu_2 \left[Post_t \times HavenShare_{i,pre} \right] + \gamma_i + \epsilon_{it}, \tag{3}$$

where $HavenShare_{i,pre}$ denotes the proportion of firm i's ownership held by investors from tax haven countries as of 2011Q4. This approach provides a direct test of whether firms with greater exposure to haven investors suffer disproportionately larger declines in investment following the policy shock.

[14] In our data, the top 5 haven countries include Hong Kong, Singapore, Luxembourg, Mauritius, and Netherlands. See Tørsløv et al. (2023) for a discussion on tax havens.

While this continuous specification is informative, it implicitly assumes a linear relationship between haven exposure and the effect of the tax amendment. To probe for potential non-linearities and to provide a more transparent comparison across different levels of haven dependence, we next estimate a second specification that replaces the continuous share with quartile-based indicators:

$$\begin{aligned} y_{it} \;=\; & \mu_0 + \mu_1 \mathbb{1}(Post_t) + \mu_{25-50}\left[\mathbb{1}(Post_t) \times \mathbb{1}(P_{25} \le HavenShare_{i,pre} < P_{50})\right] \\ & + \mu_{50-75}\left[\mathbb{1}(Post_t) \times \mathbb{1}(P_{50} \le HavenShare_{i,pre} < P_{75})\right] \\ & + \mu_{>75}\left[\mathbb{1}(Post_t) \times \mathbb{1}(HavenShare_{i,pre} \ge P_{75})\right] + \gamma_i + \epsilon_{it}, \end{aligned} \tag{4}$$

where P_{25}, P_{50}, P_{75} denote the 25th, 50th, and 75th percentiles of the haven-share distribution. Firms with haven ownership below the 25th percentile form the reference group, so all coefficients are interpreted relative to this baseline. In both specifications, we restrict attention to the subsample of firm-month observations with strictly positive haven ownership shares as of 2011Q4.

Table 4: Impact of Retrospective Tax on Investment: Role of Tax Havens

	(1)	(2)
Post × Tax Haven Share	–0.040**	
	(0.020)	
Post × Between 25th and 50th		–0.730
		(0.623)
Post × Between 50th and 75th		–1.325**
		(0.671)
Post × Above 75th		–1.731**
		(0.856)
Observations	2929	2929
R-Squared	0.72	0.72
Mean	17.93	17.93
Firm FE	Yes	Yes
Year FE	Yes	Yes
Sector FE	Yes	Yes
Year × Sector FE	Yes	Yes
Firms	594	594

Notes: The dependent variable in columns (1) and (2) is the log of capital expenditure by a firm in given year. Data are from the LSEG Annual Balance Sheet (FY 2009–10 till FY 2013–14), at the Firm × Year level. The Post dummy equals 1 for FY 2012-14 and 0 otherwise. Tax Haven Share is a continuous treatment variable denoting a firm's foreign equity from tax haven countries as of 2011Q4. The first quartile of tax haven share forms the baseline. These tax haven countries are Bahrain, Barbados, Bermuda, Bolivia, Brunei, Cayman Islands, Congo, Eswatini, Gibraltar, Greenland, Gurensey, Hong Kong, Isle of Man, Ivory Coast, Jersey, Kuwait, Macau, Mauritius, Namibia, Netherlands, Oman, Qatar, Saint Lucia, Saudi Arabia, Singapore, Trinidad and Tobago, United Arab Emirates, and Zambia (Source: PwC). The explanatory variables in column (2) are dummy variables denoting the quartile of foreign share coming from the above-mentioned tax haven countries. Standard errors clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4 reports the results, which provide strong support for the proposed mechanism. Column (1) shows that the decline in capital expenditures following the amendment is significantly larger for firms with higher haven ownership shares. The estimated coefficient of -0.040 is roughly one and a half times the baseline effect of -0.026 observed for overall foreign ownership. Column (2) further confirms this pattern: firms in higher quartiles of haven ownership experience steeper declines.[15] These findings are consistent with the view that the retrospective amendment primarily affected those firms whose foreign investors are unable to claim foreign tax credits under DTAAs.

These results also mitigate the concern that the observed decline in investment simply reflects a generalized deterioration in foreign investor sentiment about India. Instead, the concentration of effects among firms with greater exposure to investment from tax haven countries highlights our proposed mechanism: the amendment undermined government credibility by retroactively nullifying previously accepted tax arrangements.

6.2 Stock Market Response and the Cost of Capital

Stock prices provide a forward-looking measure of investors' perceptions of profitability and the cost of capital. In settings where capital-gains taxes are reduced, such as in Moon (2022), investors anticipate higher after-tax returns, lowering discount rates and raising equity valuations. In our context, the mechanism operates in the opposite direction. The retrospective amendment, by retroactively increasing the effective capital-gains burden on foreign shareholders, heightened the perceived likelihood of future discretionary taxation and thus the required return on capital. Even without changes in contemporaneous profits, firms more exposed to foreign investors should therefore experience a decline in stock valuations reflecting an increase in the user cost of capital.

To isolate the abnormal return attributable to the credibility shock, we follow the characteristic-based benchmark methodology introduced by Daniel et al. (1997). By construction, this procedure removes predictable return variation due to size, value, and momentum, isolating the residual component attributable to shocks to firms' cost of capital (see Appendix C for construction details). We run our baseline specification (2) using these benchmark-adjusted returns as the outcome variable.

We find that firms with higher pre-shock foreign ownership experienced systematically lower returns following the retrospective amendment (column (1) in Table 5). The coefficient on Post $\times$ Foreign Share remains negative and significant when we include sector-time fixed effects (column (2)). Event-study estimates (Appendix Figure A.4) further confirm that the decline in returns is driven by the policy announcement as there are no pre-trends and

[15] In case of ownership by all foreign investors, we get similar results and negative and significant coefficient for the fourth quartile.

persistent lower returns in the post-policy period. The stock-price decline is consistent with an increase in the cost of capital demanded by investors and provides a forward-looking validation of our investment results: the retrospective tax shock raised discount rates for foreign-exposed firms, tightening external financing conditions and reducing investment capacity.

Table 5: Impact of Retrospective Tax on Stock Market Returns

	Adjusted Returns	
	(1)	(2)
Post × Foreign Share	–0.026***	–0.022***
	(0.008)	(0.008)
Observations	10306	10075
R-Squared	0.26	0.31
Firm FE	Yes	Yes
Quarter FE	Yes	Yes
Sector FE	No	Yes
Quarter-Year × Sector FE	No	Yes
Firms	932	904

Notes: The dependent variable in columns is the benchmark-adjusted stock price returns (in per cent) of firms in a given quarter. Data are from the LSEG Quarterly Stock Price dataset (FY 2009–10 to FY 2013–14), at the Firm × Quarter level. The Post dummy equals one after 2012Q1, and 0 otherwise. Foreign Share is a continuous treatment variable denoting a firm's foreign equity as of 2011Q4. Benchmark return in a given quarter is the value-weighted mean return of firms in the same characteristic-sorted portfolio as in Daniel et al. (1997), where portfolios are formed on quintiles of Market Capitalization, Book-to-Market Ratio, and 6-month Momentum. Standard errors are clustered at the firm level. *** p < 0.01, ** p < 0.05, * p < 0.1.

6.3 Commitment vs. Policy Uncertainty

Before turning to the empirical distinction, it is useful to situate our argument within the broader literature on economic policy uncertainty (EPU) and its real effects. A large literature—beginning with Bloom (2009) and Julio and Yook (2012)—shows that higher levels of tax uncertainty are associated with reduced capital expenditures, as firms delay projects in anticipation of future policy changes. Firms facing significant uncertainty regarding their tax positions also engage more in corporate tax avoidance (Guenther et al., 2017; Dyreng et al., 2019), reallocating resources away from productive investment.[16] While this literature underscores the negative effects of tax uncertainty, most studies define uncertainty in terms of the complexity or unpredictability of the tax system, emphasizing random shocks and unclear rules. In contrast, we focus on a theoretically distinct channel: the economic costs arising from a failure to commit to past policies. In our setting, the concern for investors is not

[16]Survey-based evidence reinforces these patterns: a report by the European Commission finds that uncertainty regarding the effective tax rate on profits is a major factor influencing investment and location decisions, alongside political and macroeconomic conditions (Zangari et al., 2017).

merely the unpredictability of future policies, but the government's demonstrated inability, or unwillingness, to credibly commit to a tax regime over time.

If investment is lumpy and irreversible, an increase in EPU could lead to a decline in investment as the option value of waiting for more information goes up for firms in such an economic environment (Dixit and Pindyck, 1994). In our context, it is difficult to assess whether a retrospective tax or reneging on commitment would lead to an increase or decrease in EPU. A change in tax law retrospectively could be perceived as increasing policy uncertainty, signaling potential for future unpredictable policy shifts. In contrast, the amendment might be interpreted as a definitive stance by the government, indicating a hardened policy position against foreign investors. In this case, the policy change reduces uncertainty by clarifying the government's position, albeit in a direction unfavorable to investors.

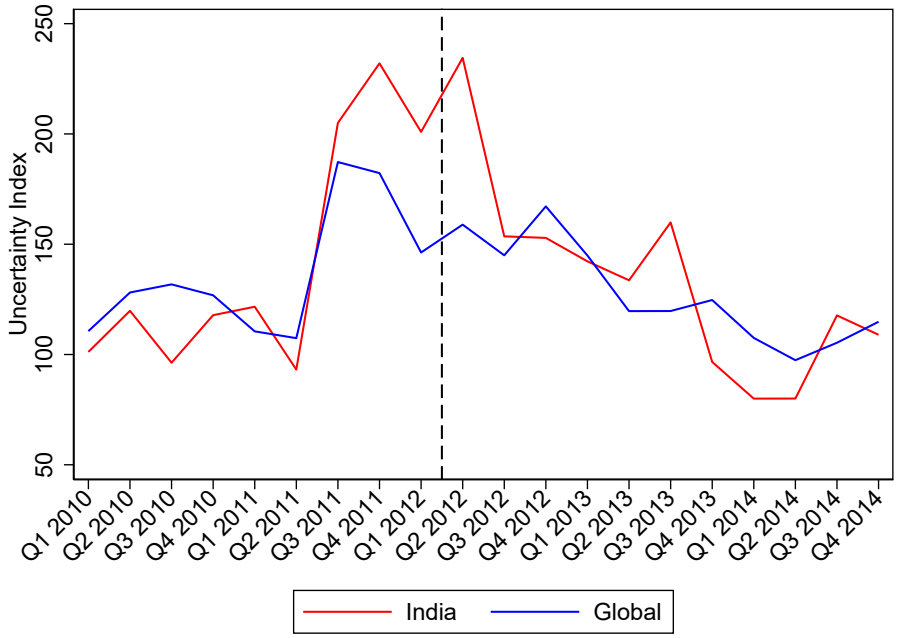
We look at the aggregate EPU in India during our focal period to gauge if there are any changes around the tax amendment. Appendix Figure 6 plots the economic policy uncertainty index from the EPU website (Baker et al., 2016). We see no significant spike in the EPU index immediately after the retrospective tax announcement. On the contrary, policy uncertainty in India is elevated in the quarters preceding the policy announcement and declines significantly few quarters thereafter. The dynamics of India's EPU index closely mirrors that of the global EPU index, suggesting that movements in policy uncertainty are largely shaped by global rather than domestic developments in India during this period.[17]

To more directly test the role of uncertainty in shaping firm investment, we augment our baseline specification in Equation 2 by including an interaction between the EPU index and the firm's pre-shock foreign equity share. The results are reported in Appendix Table A.8. While the coefficients on the uncertainty terms are significant, the coefficients on $Post_t \times ForeignShare_{i,pre}$ remain negative and significant across all specifications. Importantly, the magnitude of this coefficient is virtually unchanged relative to the baseline estimates in Table 3. These results suggest that the effect of the retrospective tax policy on investment is independent of aggregate policy uncertainty dynamics, reinforcing the interpretation that firms responded primarily to a perceived erosion of policy commitment rather than the changes in EPU.

Finally, as discussed in Section 2 the government acted swiftly, introducing the amendment within two months of losing the Supreme Court case, without initiating broader public deliberation and thereby generating no policy uncertainty in the interim. This quick sequence of events likely reinforced investor beliefs about a durable shift in policy stance, rather than

[17]Global events like the Eurozone debt crisis in Greece, Spain, Portugal, and Italy, and US debt ceiling crisis triggered a rise in global policy uncertainty during 2011. It had a spillover effect leading to a higher policy uncertainty in emerging market economies like India.

Figure 6: Dynamics of Economic Policy Uncertainty Around the Tax Amendment



Notes: The figure plots the Economic Policy Uncertainty Index for India and the Global Economic Policy Uncertainty Index from the EPU Website (see Baker et al. (2016) for details). We aggregate the indices at the quarterly level. The vertical dashed line corresponds to the retrospective tax amendment in March 2012 in India.

introducing uncertainty about future actions. This is in line with stable EPU in Figure 6. Taken together, the quantitative evidence and institutional details support the interpretation that the observed decline in investment following the amendment is better explained by a perceived breakdown in policy commitment, rather than by changes in economic policy uncertainty.

7 Welfare

In this section, we assess the welfare consequences of the credibility shock using a model of retrospective taxation, comparing outcomes under commitment and discretion. We build upon the dynamic general equilibrium framework of Chari and Kehoe (1990), henceforth CK, which explicitly incorporates the role of expectations and capital-labor substitution.[18]

[18]The setup can be traced back to Kydland and Prescott (1977), who argue that in environments without commitment technologies, the sensible way to set up the policy design problem is to formulate the decision problems of both the government and the private agents sequentially, requiring that choices be optimal at each point in time. Chari and Kehoe (1990) extend this analysis of policy design to infinite-horizon models using the worst equilibrium to characterize the entire set of equilibrium outcomes (also see Abreu, 1986; Abreu, 1988; Abreu et al., 1990).

7.1 Environment

The economy contains a large number of identical consumers and a government. There is a linear production technology for which the marginal product of capital is a constant $R > 1$ and for which the marginal product of labor is one. In each period t, consumers make decisions at two distinct points. At the first stage of t, consumers are endowed with ω units of the consumption good, out of which they consume c_{1t} and save k_t. At the second stage, they consume c_{2t} and work l_t units. Second-stage income, net of taxes, is $(1-\delta_t)Rk_t + (1-\tau_t)l_t$, where δ_t and τ_t denote the time t tax rates on capital and labor. It is assumed that first-stage consumption and second-stage consumption are perfect substitutes, and capital cannot be stored between periods. A consumer's preferences are given by the discounted value of the utility per period, $U(c_{1t}, c_{2t}, l_t)$, where the discount factor β satisfies $0 < \beta < 1$. In each period t, the government sets proportional tax rates on capital and labor income to finance an exogenously given amount of second-stage per capita government spending. We assume, throughout, that $g > (R-1)\omega$.

We extend the CK model to incorporate a representative foreign investor who supplies an exogenously given amount of foreign capital ($\bar{k}^f$). We assume that while the return on capital R exceeds the return on foreign investors' outside option $\bar{R}$, the after-tax return does not. Specifically, we assume: $R - 1 < \bar{R} < R$. Under this assumption, foreign investors will only participate if they believe the tax regime is credible. A deviation, such as the imposition of retrospective tax, results in the permanent withdrawal of foreign capital, reducing the future capital stock and output. Therefore, while $\bar{k}^f$ is exogenous, its allocation to domestic firms depends critically on the perceived credibility of tax policy.

The government's budget constraint, when it imposes an unanticipated CGT on foreign capital, is $g \leq R\delta_t(k_t + k_t^f) + \tau l_t$. This formulation highlights the temptation the government faces: by breaking its commitment, it can temporarily increase revenues through an expanded capital tax base that includes foreign investment.

In our setup, the discount factor β in the model can be interpreted in several ways. With a benevolent government that maximizes the representative household's welfare, β corresponds to the household's own discount factor. In contrast, when the government is non-benevolent, β reflects the government's own preferences and captures its patience in evaluating future payoffs. A lower value of β may thus be interpreted as greater government myopia. Alternatively, it can be understood as reflecting a stronger incentive to impose retrospective taxes on foreign capital.

We consider two versions of this economy, one in which the government can commit to its tax policy, and another in which commitment is absent—corresponding to the case with retrospective taxation.

Case I—Commitment: Under commitment, the government sets a sequence of tax rates once and for all at the beginning of time without taxing foreign capital. Consumers then choose a sequence of allocations for all time. It can be shown that the Ramsey outcome, denoted by superscript r, has the first-stage allocations $c_{1t}^r = 0$ and $k_t^r = \omega$ and a capital tax rate $\delta_t^r = (R-1)/R$. Intuitively, it is optimal to invest the entire endowment and postpone consumption in this stage. Moreover, the second-stage allocations c_{2t}^r and l_t^r and the labor tax rate τ_t^r solve

$$U^r = \max U(c_2, l) \text{ s.t. } c_2 \leq \omega + (1-\tau)l, \ -\frac{U_l}{U_c} = 1-\tau, \ g \leq (R-1)\omega + \tau l.$$

Case II—Discretion: Under lack of commitment, the government and the consumers make decisions sequentially. A sequence of policies and allocations is a competitive equilibrium if it satisfies consumer maximization and the sequence of government budget constraints (but not necessarily government maximization). Following the logic of Proposition 2 of CK[19], it can be shown that a sequence of policies and allocations forms a sustainable equilibrium if and only if it is a competitive equilibrium and satisfies the following sustainability constraint:

$$\sum_{s=t}^{\infty} \beta^{s-t} U(c_{1s} + c_{2s}, l_s) \geq U^d(k_t) + \frac{\beta}{1-\beta} U^s,$$

where

$$\begin{aligned} U^d(k_t) = \max_{\delta,\tau,c_2,l} & U(\omega - k_t + c_2, l) \\ \text{s.t. } & c_2 \leq (1-\delta)Rk_t + (1-\tau)l, \\ & -\frac{U_l}{U_c} = 1-\tau, \\ & g \leq \delta R(k_t + k_t^f) + \tau l, \end{aligned}$$

and $U^s = \max_{\tau,l} U(\omega + (1-\tau)l, l)$ s.t. $-\frac{U_l}{U_c} = 1-\tau, \ g \leq \tau l$. Here $U^d(k_t)$ denotes the utility the government obtains in the period of deviation from its announced policy, given the current capital stock k_t, while U^s represents the utility in the worst sustainable equilibrium, where households consume all of their endowment and invest zero.

It is important to note that the model captures the fact that, although the retrospective amendment directly targeted foreign investors, it also revealed information about the govern-

[19]They define a sustainable equilibrium as a sequence of history-contingent policies and allocations that satisfy certain sequential optimality conditions for the government and for private agents. This equilibrium in an infinite-horizon version of the optimal taxation model of Fischer (1980).

ment's type—specifically, its willingness to renege on past commitments when convenient. Domestic investors, observing this behavior, rationally update their beliefs about policy credibility and correspondingly reduce savings.

The next result establishes an equivalence between economies with and without foreign capital.

Proposition 1 *For any stationary k and any $(\beta, k^f) \in (0,1) \times \mathbb{R}_+$, there exists a unique $\tilde{\beta} \in (0, \beta)$ such that $(1-\beta)U^d(k; k^f) + \beta U^s = (1-\tilde{\beta})U^d(k; 0) + \tilde{\beta}U^s$.*

Proof. See Appendix E.1. ■

Proposition 1 shows that for every stationary outcome supported by a government with discount factor β and foreign holdings $k^f > 0$, there exists an equivalent economy with no foreign capital but a lower effective discount factor $\tilde{\beta} < \beta$. In other words, the presence of foreign capital effectively reduces the government's patience, tightening its incentive to renege on promised policies. This mapping allows us to interpret foreign capital as an endogenous source of impatience—one that amplifies the underlying time-inconsistency problem. Because we estimate β directly from the data, without taking a stand on whether it reflects government myopia or an increased incentive to expropriate foreign capital, we use the standard CK model for estimation purposes.

Next, we illustrate our strategy for identifying β using the CK parameterization. We then conduct a policy experiment evaluating the labor tax increase required to reproduce distortions arising from retrospective capital taxation and also examine the sensitivity of the results to capital returns to illustrate the model's mechanisms. Finally, we estimate the model using Indian data to quantify the welfare loss associated with the loss of policy credibility.

7.2 Identification of the Discount Factor

In this section, we illustrate the procedure used to map equilibrium allocations in the model to the reduced-form estimates presented in Section 5. This exercise describes how the discount factor β is identified, while the full structural estimation is presented in Section 7.5. Following CK, sustainability constraints bind when β is sufficiently low, implying lower capital accumulation and welfare under discretion. We estimate β such that the model-implied decline in capital—interpreted as the change in investment, given complete depreciation within a period—between the commitment and no-commitment regimes matches the empirically estimated decline in investment. All other parameters are held fixed across the two regimes.

We focus on stationary outcomes where allocations and policies are independent of t. Denote by x^c and $x^d(\beta)$ the stationary equilibrium outcomes under commitment and discretion, respectively, for a given discount factor β. Let y^c denote the total expenditure in

the commitment equilibrium—defined as the sum of consumption, investment, and government spending. The following result underpins our identification of β from the observed decline in capital investment.

Proposition 2 *The capital contraction* $\Delta_k(\beta) \equiv \big(k^c - k^d(\beta)\big)/k^c$ *is strictly decreasing in* β.

Proof. See Appendix E.2. ■

Proposition 2 implies that there exists a one-to-one mapping between the government's discount factor and the magnitude of the investment decline between the commitment and discretion regimes. Given the empirically observed contraction $\widehat{\Delta}_k^{\text{data}}$, we identify $\tilde{\beta}$ as the unique value satisfying $\Delta_k(\tilde{\beta}) = \widehat{\Delta}_k^{\text{data}}$. The strict monotonicity of $\Delta_k(.)$ ensures that this mapping is invertible, allowing us to recover $\tilde{\beta}$ directly from the data.

With $\tilde{\beta}$ determined in this way, we compute the implied welfare differential between the commitment and discretionary equilibria. To illustrate the procedure, we first consider the parameterization in CK (column (1) in Table 6). Specifically, we assume that the utility function is given by $U(c_1+c_2, l) = [(c_1+c_2)^\alpha + \gamma(\bar{l}-l)^\alpha]^{1/\alpha}$, and let $\alpha = -0.3$, $\gamma = 1.2$, $\bar{l} = 100$, $\omega = 10$, $g = 25$, and $R = 2$. We solve the planner's optimization problems using MATLAB's fmincon function with the SQP algorithm. Since these problems are not necessarily convex, we search for local minima starting from an initial guess close to zero in the commitment version of the model. We then use the solution to the commitment model as an initial guess in the no-commitment version of the model. Under commitment, it is optimal for private agents to save their entire endowment, i.e., $k^c = \omega = 10$. We find that $k^d(\tilde{\beta}) = 5.7$ where $\tilde{\beta} = 0.081$ (see Figure 7).[20] This represents a 43 percent decline in investment due to the loss of commitment, which aligns with our DiD estimate.[21]

Under this parameterization, we find that the reduction in welfare, in consumption equivalent terms (λ), due to the loss in commitment is about 9 percent. Specifically, $\lambda = 0.09$ solves:

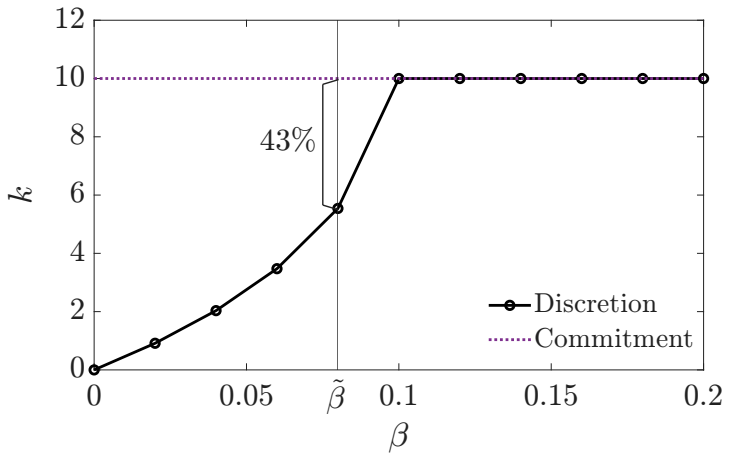
$$U(c_1^c + c_2^c, l^c) = U([c_1^d(\tilde{\beta}) + c_2^d(\tilde{\beta})](1+\lambda), l^d).$$

We also find that households substitute labor income for capital income when government interventions become discretionary (panel (f) of Figure A.5). This substitution helps cushion the negative welfare effects of discretion. We find supporting evidence for this adjustment margin in the data as well (column (5) of Table A.7).

[20] The full set of equilibrium allocations are reported in Appendix Figure A.5.

[21] Specifically, in our sample, approximately 96.9 percent of capital investment in 2012Q1 came from firms with partial or complete foreign ownership. Given that capital investment for an average firm with non-zero foreign ownership declines by about 44 percent due to the policy change, and assuming investment in domestically-owned firms remained unchanged, the total investment decline is given by $0.97 \times 44 = 43$ percent.

Figure 7: Illustration: Estimation of the Discount Factor



Notes: The figure reports optimal capital investment k under the discretion (solid line) and commitment case (dashed horizontal line). Under discretion, $\tilde{\beta}$ generates a 43 percent decline in k, matching the capital investment decline estimated in Section 5.

Comparison to a Partial Equilibrium Model: For reference, Appendix D presents a partial-equilibrium exercise in which a decline in foreign investment directly translates into steady-state welfare losses within a standard growth framework. This analysis holds labor allocations fixed and therefore omits the general-equilibrium adjustments present in our baseline model, leading to an overstatement of the welfare loss.

7.3 Labor Tax Adjustment under Commitment

To better understand the welfare implications of a loss of credibility, we consider the following exercise. By how much would the labor tax rate need to increase under commitment to replicate the welfare losses observed when the planner shifts to discretionary policy?

In the commitment framework, the planner sets the capital tax rate at a level that leaves households indifferent between consuming in the first stage and saving. This optimal capital tax rate ensures efficient intertemporal allocation and is set at $(R-1)/R$. Any increase in the capital tax rate beyond this level would drive household savings to zero, implying that the welfare loss from further increases in capital taxation is constant rather than increasing with the tax rate. Because of this feature, we cannot meaningfully ask how welfare changes as the capital tax rate rises under commitment and instead look at labor taxes.

Formally, we define

$$(c^\tau(\tau), l^\tau(\tau)) \in \arg\max_{c,l} U(c,l) \quad \text{s.t.} \quad \begin{aligned} c &\leq \omega + (1-\tau)l, \\ -\frac{U_l}{U_c} &= 1-\tau, \\ g &\leq (R-1)\omega + \tau l, \end{aligned}$$

where the capital tax rate is fixed at its optimal level, $(R-1)/R$. We then solve for $\tilde{\tau}$ such that

$$U(c^{\tau}(\tilde{\tau})(1+\Delta W), l^{\tau}(\tilde{\tau})) = U(c_1^c + c_2^c, l^c),$$

where ΔW denotes the estimated welfare cost of discretion.

The welfare effects operate through two components. First, $\Delta c \equiv (c^{\tau} - c^c)$ captures the decline in aggregate consumption as higher labor taxes reduce disposable income and output. Second, $\Delta l \equiv (l^{\tau} - l^c)$ measures the contraction in labor supply resulting from a lower after-tax wage. Both margins move in the same direction: an increase in τ reduces labor effort, compresses output, and thereby lowers consumption. Quantitatively, the implied $\tilde{\tau} = 43.8$ percent represents a 7.3 percentage-point increase relative to the Ramsey rate, generating a welfare loss equivalent to that under the discretionary regime.[22] Moreover, relative to the high-tax commitment regime, the long-run output decline is substantially larger under discretion because credibility loss leads households to consume rather than invest their endowment, thereby forgoing the net return $(R-1)$ on those unrealized investments (see Appendix Figure A.6).

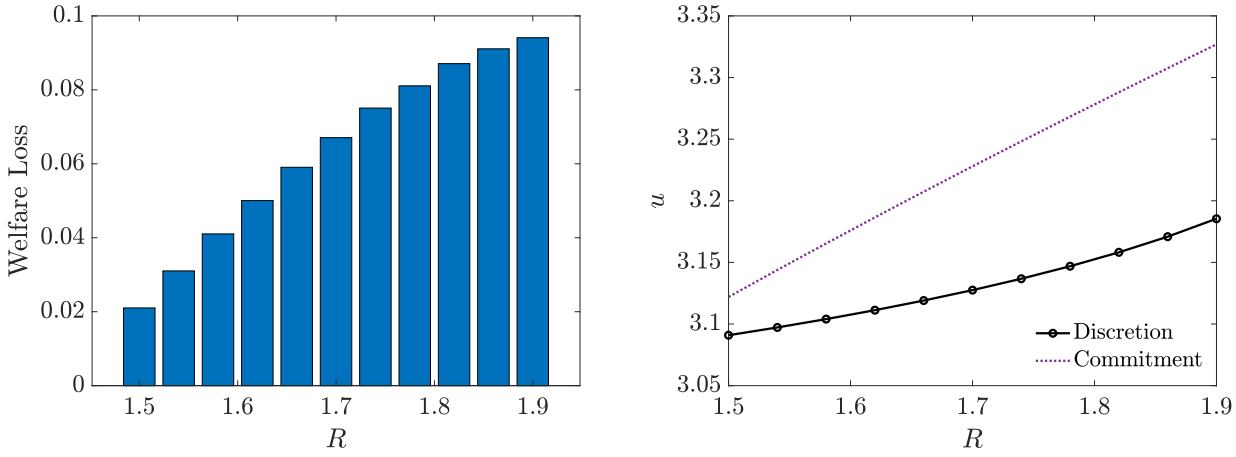
7.4 Sensitivity to the Marginal Product of Capital

The large welfare losses from discretion are primarily attributable to the high value of R. In this class of models, R determines the marginal return on investment within the period. A higher value of R implies that investment has a greater impact on contemporaneous output, thereby amplifying the incentive for governments under discretion to exploit investment ex post via capital taxation. This time inconsistency generates larger distortions when R is high, increasing the welfare cost of discretionary policy. To see this, note that $U^d(.)$ is increasing in R. When R is low, the government's inability to commit has relatively small effects, since investment contributes relatively little to output. When R is high, the government's inability to commit severely distorts behavior, leading to large welfare losses.

This relationship is illustrated numerically in Figure 8, which plots the sensitivity of the welfare cost of discretion to variations in R, holding all other parameters fixed at their CK values. Panel (a) shows that the welfare loss increases with an increase in R. While both the value under discretion and commitment increase with R (Panel (b)), the former grows at a slower rate, reflecting the rising value of the deviation. These findings underscore the sensitivity of welfare to the return on capital, motivating our subsequent parametrization of the model using Indian data.

[22] Under the estimated set of parameters (detailed in Section 7.5), the labor tax rate would need to rise by approximately 3.3 percent to generate welfare losses comparable to those observed under discretionary policy.

Figure 8: Impact of R on Welfare Loss from Discretionary Policy



(a) Welfare Loss (b) Value Functions

Notes: Panel (a) depicts simulated welfare losses from discretion as a function of the return on capital R. Panel (b) plots the value function under discretion and commitment as a function of R. Barring R, the reported graphs use the CK parametrization.

7.5 Minimum-Distance Estimation: Parametrization using Indian Data

We fix the elasticity of substitution, α, at the benchmark value used by CK and estimate the remaining parameters

$$\theta \equiv (\gamma,\, \bar{l},\, \omega,\, g,\, R,\, \beta)'.$$

The vector θ governs, respectively, the weight on leisure in utility, the upper bound on labor supply, the period endowment, per capita government spending, the marginal product of capital, and the discount factor.

Let $m^{\text{data}} \in \mathbb{R}^K$ denote the empirical vector of moments and $m^{\text{model}}(\theta) \in \mathbb{R}^K$ the corresponding theoretical moments implied by the model. The first five moments—comprising the expenditure shares of private consumption $\left([c_1^c + c_2^c]/y^c\right)$, private investment $\left(k^c/y^c\right)$, and government expenditure $\left(g/y^c\right)$, together with the steady-state capital- and labor-income tax rates $\left(\delta^c,\, \tau^c\right)$—are derived from the stationary equilibrium under commitment. The sixth moment, the contraction in capital when moving from the commitment to the discretionary regime, is obtained as the model-implied difference $\frac{k^c - k^d(\beta)}{k^c}$. As discussed in section 7.2, this cross-regime moment links the two equilibria and captures how the discount factor β governs the tightness of the sustainability constraint and, consequently, the extent of the investment contraction consistent with the data.

We define the minimum-distance estimator as:

$$\hat{\theta} = \arg\min_{\theta \in \Theta} Q_T(\theta), \qquad Q_T(\theta) = \left[m^{\text{model}}(\theta) - m^{\text{data}}\right]^\top W \left[m^{\text{model}}(\theta) - m^{\text{data}}\right], \tag{5}$$

where $W = I_K$. Identification follows from the next proposition.

Proposition 3 *The Jacobian $D_\theta m(\theta)$ is full rank, and θ is locally identified up to the normalization of total expenditure y^c and the labor endowment $\bar{l}$.*

Proof. See Appendix E.3. ■

We normalize y^c to 1, and choose $\bar{l}$ so that the implied leisure weight parameter γ matches the value in the CK specification.[23] Solving (5) yields

$$\hat{\theta} = (\hat{\gamma},\, \hat{\bar{l}},\, \hat{\omega},\, \hat{g},\, \hat{R},\, \hat{\beta})' = (1.2,\, 1.34,\, 0.225,\, 0.15,\, 1.25,\, 0.003)'.$$

Table 6: Targeted Moments and Simulated Outcomes

Moment	CK Spec. (1)	Estimated (2)	Data (3)	Source (4)
Decline in investment post-reform ($-[k^c - k^d(\beta)]/k^c$)	−43%	−43%	−43%	DiD Estimate
Consumption-to-GDP ($[c_1^c + c_2^c]/y^c$)	51%	62.5%	62.5%	GoI ES
Investment-to-GDP (k^c/y^c)	14%	22.5%	22.5%	GoI ES
Govt. spending-to-GDP (g/y^c)	35%	15%	15%	GoI ES
Capital tax rate (δ^c)	0.50	0.20	0.20	CBDT
Labor tax rate (τ^c)	0.37	0.19	0.19	CBDT, MoSPI

Notes: Column (1) reports the calibration used in CK. Columns (2) and (3) report the model-matched moments and the corresponding empirical targets, respectively, using Indian macro-fiscal data. Sources: Government of India Economic Survey (GoI ES); Central Board of Direct Taxes (CBDT); Ministry of Statistics and Programme Implementation (MoSPI).

The minimum-distance estimator reproduces the targeted moments exactly, confirming that the estimated parameter vector $\hat{\theta}$ rationalizes the empirical moments under the equilibrium conditions implied by the model (see columns (2) and (3) of Table 6). The implied steady-state capital-income tax rate $\delta^c = 0.20$ matches the statutory long-term capital-gains rate for 2011–12,[24] while the steady-state labor-income tax rate $\tau^c = 0.19$ matches the effective rate inferred from national accounts and income-tax statistics.[25] The composition of stationary expenditures matches the empirical counterparts from national account data over 1997–2012. Private gross fixed capital formation at current prices averaged about 22.5 percent of GDP over this period (Government of India, 2025). Central-government expenditures

[23] See step 3 of the proof of Proposition 3 for details.

[24] Capital fully depreciates within a period, so the gross return Rk coincides with the realized capital gains. We therefore interpret $\delta = 0.2$ as a 20 percent tax on realized capital gains.

[25] The effective average tax rate on formal labor income can be inferred from official data from national accounts and the Income Tax Department. Personal income-tax (PIT) receipts amounted to INR 1.70 lakh crore in 2011–12 (Central Board of Direct Taxes, 2021), while aggregated salary income declared by taxpayers was INR 6.26 lakh crore (Central Board of Direct Taxes, 2016). Given that the organized sector accounted for roughly 70 percent of total compensation of employees according to the National Accounts (Ministry of Statistics and Programme Implementation, 2014), this implies an effective tax rate on formal labor income of approximately 19 ($= 0.7 \times 1.70/6.26$) percent.

accounted for roughly 15 percent of GDP, while the residual 62.5 percent is attributed to private consumption.[26]

These estimates imply a welfare loss from discretionary policy of approximately three percent of steady-state consumption. To gauge the magnitude, this loss exceeds by an order of magnitude the welfare cost of typical business-cycle fluctuations (Lucas, 1987) and is comparable to the welfare losses associated with severe macroeconomic disruptions such as the global financial crisis (Glover et al., 2020). Taken together, these results highlight that even a one-time credibility shock can have lasting macroeconomic consequences by depressing investment and long-run output.

8 Conclusion

India's 2012 retrospective tax amendment marked a departure from earlier applications of retrospective taxation by creating a new liability on past offshore transactions, despite a prior Supreme Court ruling. Although the amendment was never enforced and was eventually repealed, its announcement had significant real effects. Firms with higher foreign ownership sharply reduced capital investment, reflecting concerns over a breakdown in policy credibility. A dynamic general equilibrium model shows that such discretionary interventions can impose substantial long-term welfare costs. These findings underscore the importance of credible fiscal frameworks, particularly for emerging markets seeking to attract sustained foreign investment.

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A Appendix Tables and Figures

Table A.1: Impact of Retrospective Tax on Foreign Ownership Share: By Investor Type

	Foreign Corporation	Foreign Holding Company	Foreign Hedge Funds/ Foreign Investment Advisors	Foreign SWF/ Foreign Pension Fund/ Foreign Banks
	(1)	(2)	(3)	(4)
Post	–0.957***	–0.642**	–0.396***	–0.260***
	(0.132)	(0.262)	(0.067)	(0.042)
Observations	6458	1615	9413	4718
R-Squared	0.96	0.96	0.86	0.85
Mean	20.29	17.85	6.19	2.38
Firm FE	Yes	Yes	Yes	Yes
Firms	539	135	787	394

Notes: The dependent variables in columns (1)–(4) is shareholding by different foreign shareholder types in a given quarter. Corporation refers to public and private corporations that hold equity stakes in firms, typically for strategic or long-term investment purposes. Holding company refers to foreign entities that primarily exist to own shares in other companies rather than producing goods or services themselves. These may include investment vehicles or conglomerates. Foreign Hedge Funds / Foreign Investment Advisors include institutional investors such as hedge funds, asset management firms, and registered investment advisors that manage pooled or client capital and engage in portfolio investments. Foreign SWF / Foreign Pension Fund / Foreign Banks include sovereign wealth funds (government-owned investment funds), pension funds (managing retirement assets), and foreign banks investing for proprietary purposes or on behalf of clients. Data are from the LSEG Ownership Data (January 2011–December 2013), at the Firm × Quarter level. The results are based on estimating the Equation 1 for different sample of investors. The Post dummy equals 1 for period January 2012–December 2013; and 0 otherwise. Standard errors are robust. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.2: Impact of Retrospective Tax on Investment: Event Study Robustness

	Investment			Investment Dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
2010 × Foreign Share	–0.014	–0.014	–0.011	–0.001	–0.001	–0.000
	(0.009)	(0.009)	(0.009)	(0.000)	(0.000)	(0.000)
2012 × Foreign Share	–0.011	–0.011	–0.010	–0.000	–0.000	–0.000
	(0.010)	(0.010)	(0.010)	(0.000)	(0.000)	(0.000)
2013 × Foreign Share	–0.032**	–0.032**	–0.031**	–0.001**	–0.001**	–0.001**
	(0.014)	(0.014)	(0.014)	(0.001)	(0.001)	(0.001)
2014 × Foreign Share	–0.052***	–0.052***	–0.053***	–0.002***	–0.002***	–0.002***
	(0.016)	(0.016)	(0.016)	(0.001)	(0.001)	(0.001)
Observations	5607	5607	5499	5607	5607	5499
R-Squared	0.75	0.75	0.76	0.71	0.71	0.72
Mean	15.94	15.94	16.11	0.84	0.84	0.85
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	No	Yes	Yes
Sector FE	No	No	Yes	No	No	Yes
Year × Sector FE	No	No	Yes	No	No	Yes
Firms	1133	1133	1111	1133	1133	1111

Notes: The dependent variable in columns (1)–(3) is the log of capital expenditure by the firm in a given year. In columns (4)–(6), the dependent variable is a dummy equal to 1 if a firm has non-zero capital expenditure, else zero. Data are from the LSEG Annual Balance Sheet (FY 2009–10 till FY 2013–14), at the Firm × Year level. The results are based on estimating Equation 2. The Post dummy equals 1 for FY 2012-14 and 0 otherwise. Foreign Share is a continuous treatment variable denoting a firm's foreign equity as on 2011Q4. Standard errors clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.3: Impact of Retrospective Tax on Investment: Robustness to Alternative Firm Controls

	Investment		Investment Dummy	
	(1)	(2)	(3)	(4)
Post × Foreign Share	–0.019*	–0.040***	–0.001*	–0.002***
	(0.011)	(0.011)	(0.000)	(0.000)
Post × Firm Size	–0.249***		–0.011***	
	(0.030)		(0.001)	
Post × Leverage		–0.499***		–0.021***
		(0.064)		(0.003)
Observations	5499	5499	5499	5499
R-Squared	0.77	0.77	0.74	0.73
Mean	16.11	16.11	0.85	0.85
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Year × Sector FE	Yes	Yes	Yes	Yes
Firms	1111	1111	1111	1111

Notes: The dependent variable in columns (1)–(2) is the log of capital expenditure by the firm in given year. In columns (3)–(4), the dependent variable is a dummy equal to 1 if a firm has non-zero capital expenditure, else zero. Data are from the LSEG Annual Balance Sheet (FY 2009–10 till FY 2013–14), at the Firm × Year level. The Post dummy equals 1 for FY 2012-14 and 0 otherwise. Foreign Share is a continuous treatment variable denoting a firm's foreign equity as of December 2011. Firm Size is a continuous treatment variable denoting firm revenue levels as of December 2011. Leverage is a continuous treatment variable capturing firm's debt–to–equity ratio as of December 2011. Standard Errors are clustered at the firm-level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.4: Impact of Retrospective Tax on Investment: Quartile Treatment

	Investment			Investment Dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
Post	0.338			0.015		
	(0.327)			(0.015)		
Post × 2nd Quartile	0.183	0.178	–0.107	0.010	0.010	–0.003
	(0.478)	(0.479)	(0.495)	(0.020)	(0.021)	(0.021)
Post × 3rd Quartile	0.279	0.279	0.210	0.012	0.012	0.011
	(0.496)	(0.496)	(0.519)	(0.022)	(0.022)	(0.022)
Post × 4th Quartile	–1.393**	–1.397**	–1.504**	–0.058**	–0.058**	–0.061**
	(0.561)	(0.561)	(0.589)	(0.024)	(0.024)	(0.025)
Observations	5607	5607	5499	5607	5607	5499
R-Squared	0.75	0.75	0.76	0.71	0.71	0.72
Mean	15.94	15.94	16.11	0.84	0.84	0.85
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	No	Yes	Yes
Sector FE	No	No	Yes	No	No	Yes
Year × Sector FE	No	No	Yes	No	No	Yes
Firms	1133	1133	1111	1133	1133	1111

Notes: The dependent variable in columns (1)–(3) is the log of capital expenditure by the firm in a given year. In columns (4)–(6), the dependent variable is a dummy equal to 1 if a firm has non-zero capital expenditure, else zero. Data are from the LSEG Annual Balance Sheet (FY 2009–10 till FY 2013–14) at the Firm × Year level. The results are based on estimating Equation 2. The Post dummy equals 1 for FY 2012-14, and 0 otherwise. The quartiles refer to pre-period foreign share quartile of the firm.. Standard errors clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.5: Impact of Retrospective Tax on Investment: Domestic vs. Foreign

	Investment			Investment Dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
Post	1.698***			0.081***		
	(0.156)			(0.007)		
Post × 1(Foreign Firm)	–1.594***	–1.593***	–1.653***	–0.076***	–0.076***	–0.077***
	(0.247)	(0.247)	(0.267)	(0.011)	(0.011)	(0.012)
Observations	14729	14729	14184	14729	14729	14184
R-Squared	0.84	0.84	0.84	0.81	0.81	0.81
Mean	9.27	9.27	9.65	0.60	0.60	0.62
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	No	Yes	Yes
Sector FE	No	No	Yes	No	No	Yes
Year × Sector FE	No	No	Yes	No	No	Yes
Firms	2992	2992	2879	2992	2992	2879

Notes: The dependent variable in columns (1)–(3) is the log of capital expenditure by the firm in a given year. In columns (4)–(6), the dependent variable is a dummy equal to 1 if a firm has non-zero capital expenditure, else zero. Data are from the LSEG Annual Balance Sheet (FY 2009–10 till FY 2013–14), at the Firm × Year level. The results are based on estimating Equation 2. The Post dummy equals 1 for FY 2012-14 and 0 otherwise. Foreign Firm is a binary variable denoting whether a firm has any level of foreign equity as of 2011Q4. Standard errors clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.6: Impact of Retrospective Tax on Investment: Robustness (IHS)

	(1)	(2)	(3)
Post	0.281**		
	(0.134)		
Post × Foreign Share	–0.013**	–0.013**	–0.015**
	(0.006)	(0.006)	(0.006)
Observations	5607	5607	5499
R-Squared	0.78	0.78	0.79
Mean	11.43	11.43	11.54
Firm FE	Yes	Yes	Yes
Year FE	No	Yes	Yes
Sector FE	No	No	Yes
Year × Sector FE	No	No	Yes
Firms	1133	1133	1111

Notes: The dependent variable in columns (1)–(3) is the log of inverse hyperbolic sine of capital expenditure by the firm in a given year. Data are from the LSEG Annual Balance Sheet (FY 2009–10 till FY 2013–14) at the Firm × Year level. The results are based on estimating Equation 2. The Post dummy equals 1 for FY 2012-14, and 0 otherwise. Foreign Share is a continuous treatment variable denoting a firm's foreign equity as of 2011Q4. Standard errors clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.7: Impact of Retrospective Tax on Other Firm-level Outcomes

	Revenue (1)	Total Assets (2)	Leverage (3)	Total Debt (4)	Employees (5)
Post × Foreign Share	–0.018*	–0.017*	–0.006	–0.007	0.012*
	(0.011)	(0.010)	(0.004)	(0.011)	(0.006)
Observations	5499	5499	5499	5499	5499
R-Squared	0.77	0.77	0.79	0.81	0.73
Mean	19.10	19.82	1.97	12.64	0.77
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
Year × Sector FE	Yes	Yes	Yes	Yes	Yes
Firms	1111	1111	1111	1111	1111

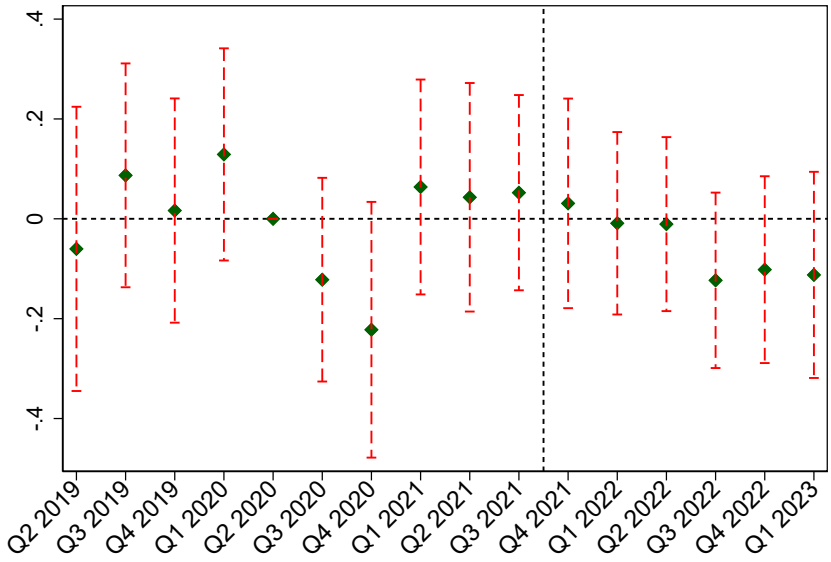
Notes: The dependent variables in columns (1)–(5) are the log values of firm-level outcomes in given year. Revenue refers to the total value of receipts from sales of products and services. Total assets represents the total current and non–current assets reported by the firm. Leverage refers to the ratio of total debt divided by the value of total shareholders' equity. Total Debt refer to the sum of long-term and short-term borrowings of the firm. Employees refer to the total number of full–time employees in a firm. Data are from the LSEG Annual Balance Sheet (FY 2009–10 till FY 2013–14), at the Firm × Year level. The Post dummy equals 1 for FY 2012-14 and 0 otherwise. Foreign share is a continuous treatment variable denoting a firm's foreign equity as of December 2011. Standard errors clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.8: Impact of Retrospective Tax on Investment: Controlling for Uncertainty

	Investment			Investment Dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
Post	0.542**			0.025**		
	(0.242)			(0.010)		
Post × Foreign Share	–0.026**	–0.026**	–0.027**	–0.001**	–0.001**	–0.001**
	(0.011)	(0.011)	(0.012)	(0.000)	(0.000)	(0.000)
EPU × Foreign Share	0.020***	0.020***	0.020***	0.001***	0.001***	0.001***
	(0.006)	(0.006)	(0.006)	(0.000)	(0.000)	(0.000)
Observations	5607	5607	5499	5607	5607	5499
R-Squared	0.75	0.75	0.76	0.71	0.71	0.72
Mean	15.94	15.94	16.11	0.84	0.84	0.85
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	No	Yes	Yes
Sector FE	No	No	Yes	No	No	Yes
Year × Sector FE	No	No	Yes	No	No	Yes
Firms	1133	1133	1111	1133	1133	1111

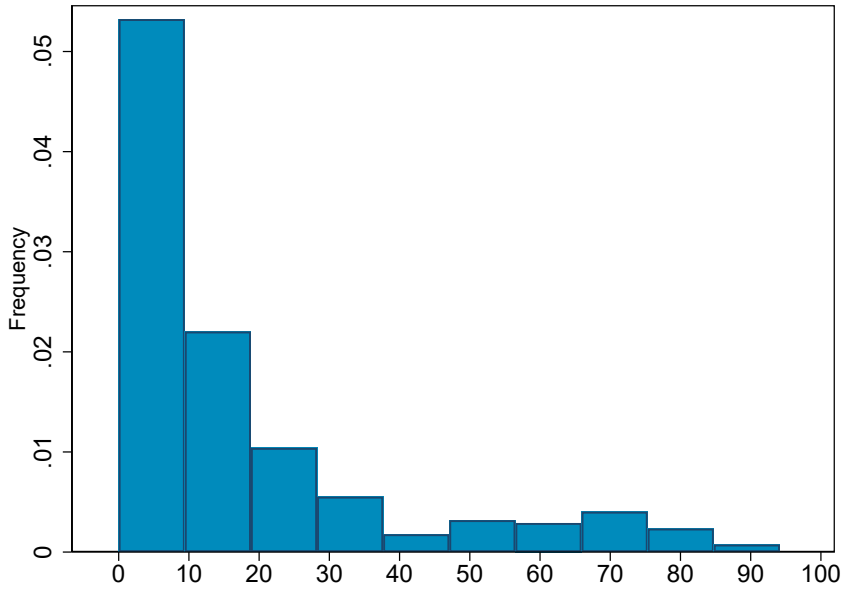
Notes: The dependent variable in columns (1)–(3) is the log of capital expenditure by the firm in given year. In columns (4)–(6), the dependent variable is a dummy equal to 1 if a firm has non-zero capital expenditure, else zero. Data are from the LSEG Annual Balance Sheet (FY 2009–10 till FY 2013–14), at the Firm × Year level. The Post dummy equals 1 for FY 2012-14 and 0 otherwise. Foreign Share is a continuous treatment variable denoting a firm's foreign equity as of 2011Q4. EPU denotes the Economic Policy Uncertainty index for India from the EPU Website and its standardized values are used in the regression. Standard errors clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure A.1: Impact of Repealing the Retrospective Tax on Foreign Equity Share



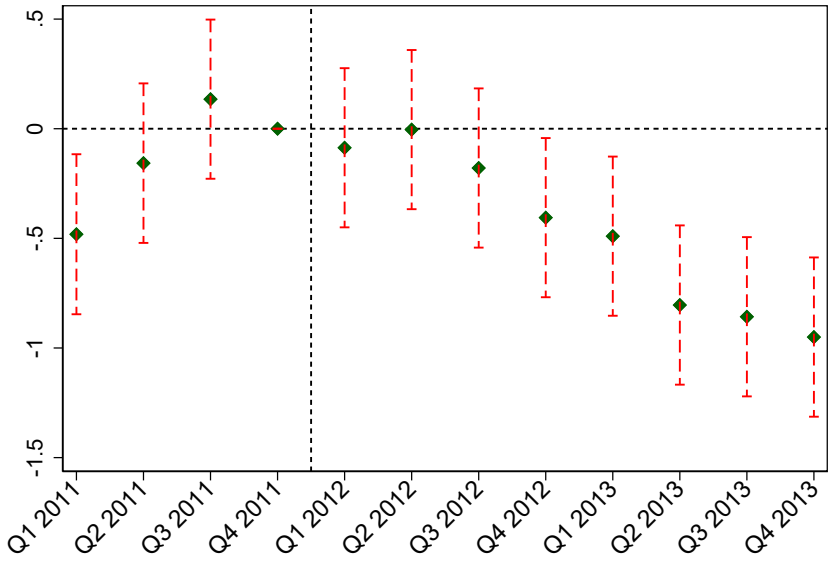
Notes: The dependent variable is foreign equity share in a firm. Data are from the LSEG Ownership Data (April 2019–March 2023), at the Firm × Quarter level. The vertical line corresponds to August 2021, when the retrospective tax was repealed. This is an event-study where x-axis shows month dummies and y-axis captures the difference in foreign share, relative to baseline 2020Q2. Standard errors are robust.

Figure A.2: Histogram: Share of Firm-level Foreign Ownership in 2011Q4



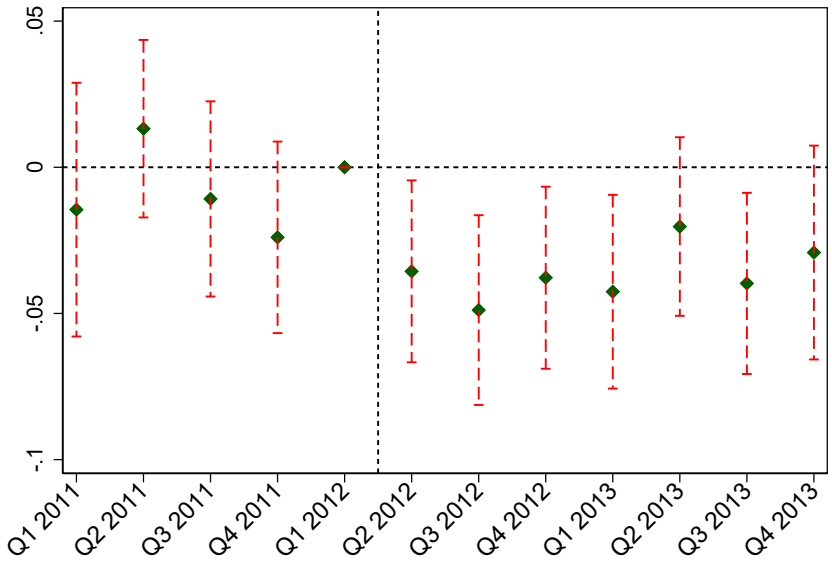
Notes: This figure shows the distribution of firms by their foreign ownership share as of 2011Q4. Foreign share is defined as the fraction of a firm's equity held by foreign investors. We focus on firms with a non-zero foreign share in the pre–period. The share values are reported in percentages.

Figure A.3: Impact of Retrospective Tax on Foreign Equity Share from Tax Haven Countries



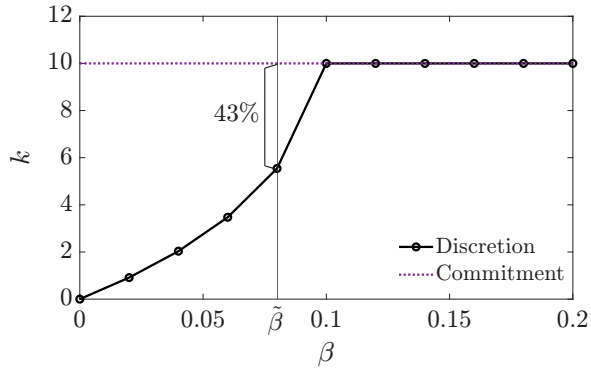
Notes: The dependent variable is foreign equity in a firm from tax haven countries. Data are from the LSEG Ownership Data (April 2011–March 2013), at the Firm × Quarter level. The results are based on estimating Equation 1. This is an event-study where x-axis shows month dummies and y-axis captures the difference in foreign share, baseline 2011Q4. Standard errors are robust.

Figure A.4: Event Study: Impact of Retrospective Tax on Stock Market Returns

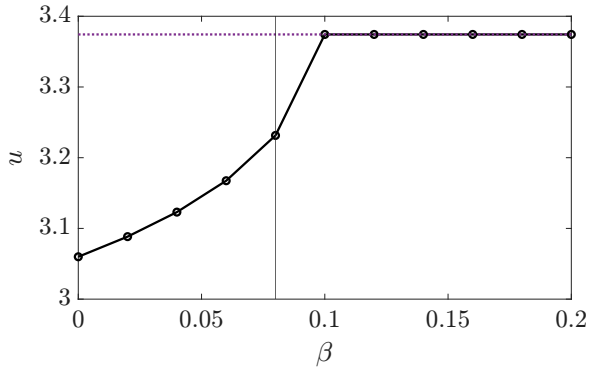


Notes: The dependent variable is the benchmark-adjusted stock price return (in percent) of a firm in a given quarter. Data are from the LSEG Quarterly Stock Price dataset (FY 2009–10 to FY 2013–14), at the Firm × Quarter level. This is an event-study where x-axis shows the month dummies × Foreign share and y-axis captures the difference in benchmark-adjusted returns with 2011Q4 as baseline. Foreign Share is a continuous treatment variable denoting a firm's foreign equity as of 2011Q4. Benchmark return at a given quarter is the value-weighted mean return of firms in the same characteristic-sorted portfolio as in Daniel et al. (1997), where portfolios are formed on quintiles of Market Capitalization, Book-to-Market Ratio, and 6-month Momentum. Standard errors are clustered at the firm level.

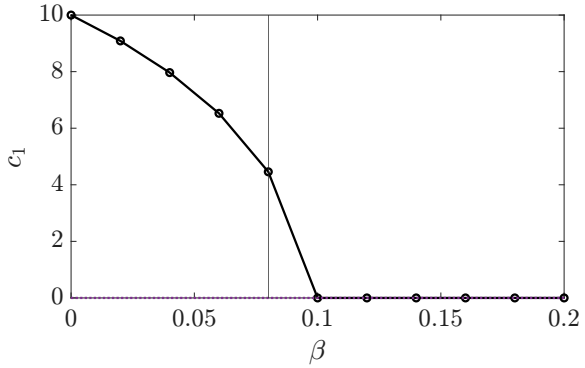
Figure A.5: Stationary Outcomes under the CK Parametrization



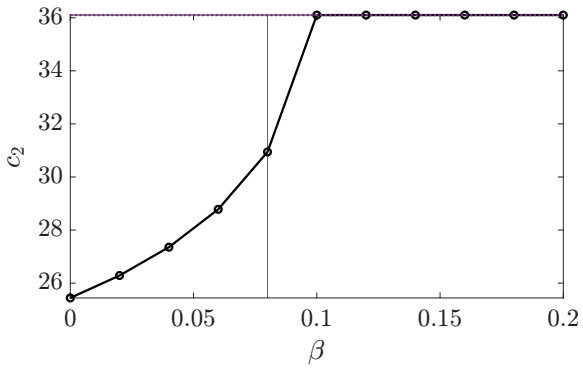
(a) Investment



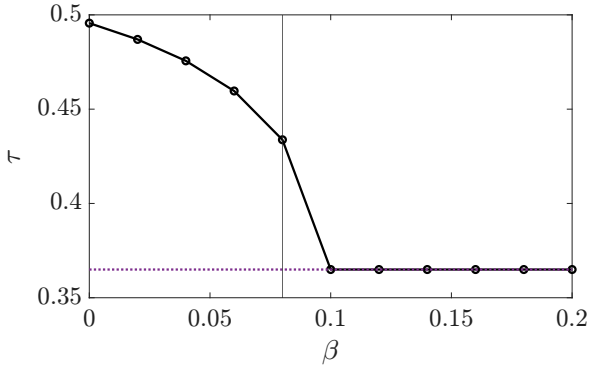
(b) Welfare



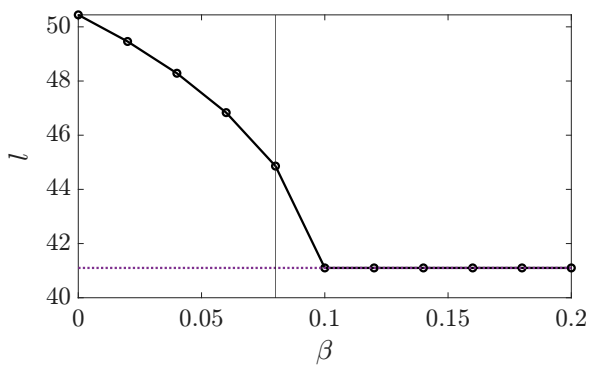
(c) Stage 1 Consumption



(d) Stage 2 Consumption

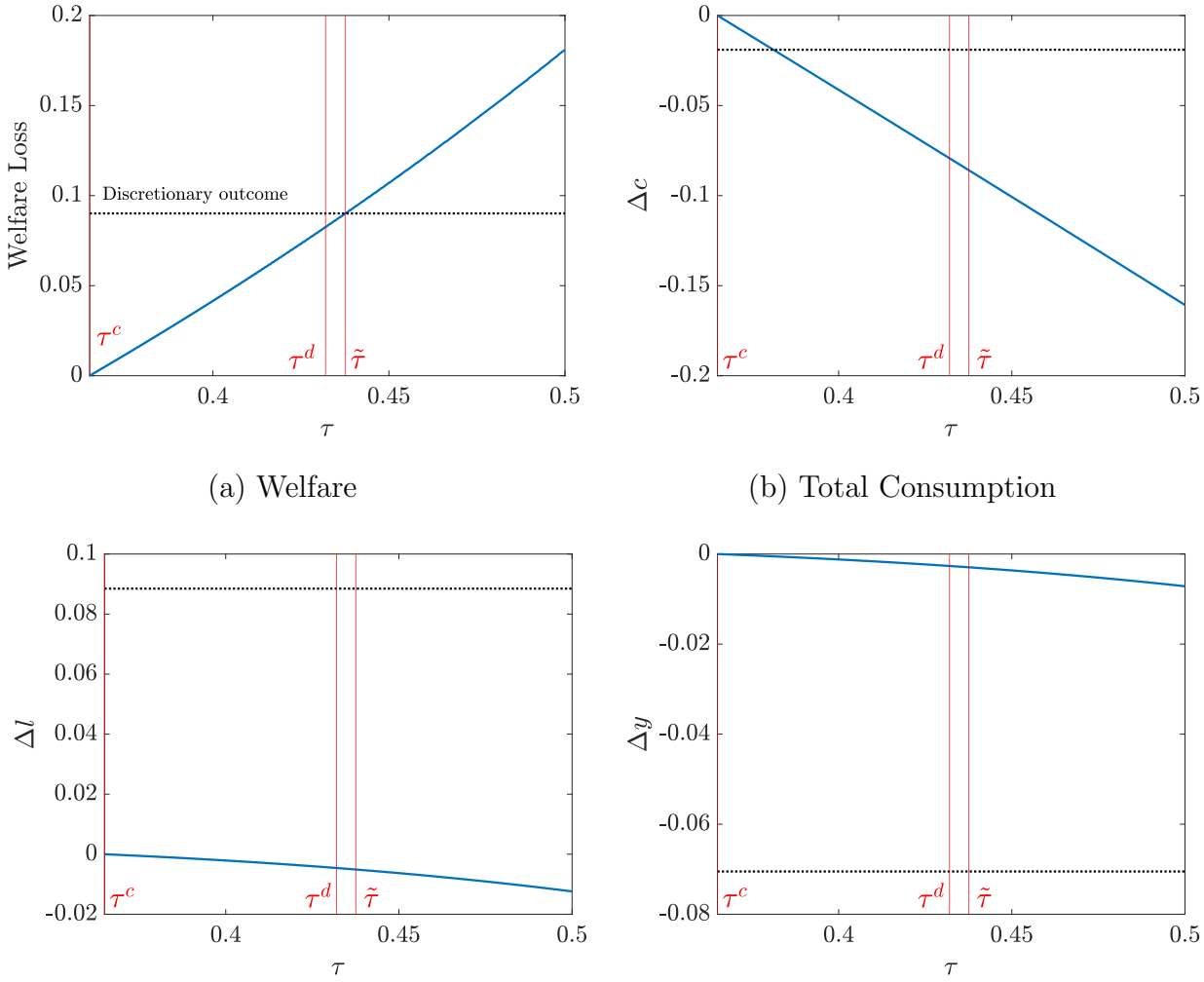


(e) Optimal Labor Tax Rate



(f) Hours Worked

Figure A.6: Discretionary Regime vs. High Tax Commitment Regime



(a) Welfare

(b) Total Consumption

(c) Hours Worked

(d) Output

Notes: This figure plots outcomes under commitment as the labor tax rate rises above its optimal level, and compares them with those under discretion. τ^c denotes the Ramsey (optimal) labor tax rate, τ^d the implied rate under discretion, and $\tilde{\tau}$ the counterfactual commitment rate yielding the same welfare loss as discretion. Panels (a)–(d) plot percentage deviations in welfare, total consumption (Δc), labor supply (Δl), and output (Δy) relative to the Ramsey outcome. Vertical red lines mark τ^c, τ^d, and $\tilde{\tau}$; the horizontal dotted line shows the discretionary benchmark.

B Details: Newspaper Article Selection

B.1 Data Collection

Articles for the analysis were sourced from the Factiva database, which aggregates global news publications. This data set includes articles from five major Indian Business newspapers: Indian Express, The Hindu, Mint, Business Standard, and Financial Express. The period covered was January 2010 to December 2014, capturing the highly publicized Vodafone vs. Government of India tax dispute, and the subsequent retrospective tax amendments introduced in the 2012 annual Union Budget.

In order to identify relevant articles for both topics, targeted keyword searches were conducted. For the Vodafone v/s Government of India case, the keywords included: "Vodafone and India and ("retrospective tax" or "retrospective taxation") and (tribunal or arbitration or ICSID or verdict or ruling or dispute). For retrospective taxation, the keywords included: "retrospective tax or retrospective taxation" and India. As a result, a total of 2,686 news articles were produced. The resulting set was then exported to an excel spreadsheet, with metadata having publication date, source, and full text of the article.

B.2 Classification

To ensure that the classification is accurate, we use the OpenAI API (GPT–4). A prompt was structured to instruct the model to assign each article the most appropriate category based on its content. The API–generated classifications were then validated against a machine learning classification model (XGBoost), trained on 100 manually labeled articles. The output of both models was compared to assess consistency. The discrepancies were then manually reviewed.

Figure 3 shows a sudden spike in discussions around retrospective tax in India, reflecting increased public and media attention during this period.

C Construction of Benchmark-Adjusted Returns

We compute the benchmark-adjusted returns as follows:

1. **Unadjusted Return:** For each firm, we measure the raw return as the log change in month-end stock price between $t-1$ to t.

2. **Triple sort:** At the beginning of each month, all firms are sorted sequentially on three characteristics: (i) market capitalization (MC), (ii) book-to-market ratio (BM), and (iii) momentum (MOM, defined as the six-month cumulative returns excluding the most recent month). Firms are first assigned to quintiles by MC. Within each MC quintile, they are further sorted into quintiles by BM. Within each MC-BM cell (25 total), firms are finally sorted into quintiles by MOM. This $5 \times 5 \times 5$ triple sort produces 125 benchmark portfolios. Each portfolio is value-weighted and rebalanced monthly.

3. **Benchmark assignment:** Each firm-month observation is matched to one of these 125 benchmark portfolios according to its characteristics at the start of the month.

4. **Adjusted return:** The benchmark-adjusted return is defined as:

$$\text{AdjRet}_{it} = R_{it} - R_t^{B(i,t)},$$

where R_{it} is firm i's raw return in month t, and $R_t^{B(i,t)}$ is the return of the firm i's matched benchmark portfolio.

D Partial Equilibrium Framework à la Solow (1956)

This appendix presents a complementary partial-equilibrium exercise that serves as a benchmark for the welfare losses estimated under general equilibrium in Section 7. We adopt a standard growth framework in which steady-state output depends on both domestic savings and foreign investment. By holding labor allocations fixed, and abstracting from general-equilibrium feedbacks and expectation effects, this exercise isolates the direct impact of a decline in foreign capital on steady-state consumption and welfare.

Proposition 4 *Suppose the marginal propensity to consume (MPC) is constant, net exports are zero, and the production function is Cobb-Douglas with capital share α. Then the change in welfare (in consumption equivalent terms) in steady state due to a change in foreign investment-per-worker (f) is given by:*

$$\Delta W = \frac{k(f^{pre} + \Delta f)^{\alpha}}{k(f^{pre})^{\alpha}} - 1,$$

where $k(.)$ is given by the implicit function that solves the following equation:

$$(1 - MPC)k^{\alpha} + f = \phi k,$$

where ϕ is the depreciation rate of capital.

Proof. Let $Y_t = AK_t^{\alpha}L_t^{1-\alpha}$. Normalizing A to 1, and dividing by L_t, we get the output-per-worker (y_t) in terms of capital-per-worker (k_t):

$$y_t = k_t^{\alpha}.$$

Capital evolves according to:

$$K_{t+1} = K_t(1 - \phi) + I_t.$$

In steady-state $K_{t+1} = K_t$, so

$$I_t = \phi K_t.$$

Note that in an open economy, $I_t = S_t + F_t$, where S_t denotes domestic savings and F_t denotes foreign investment. We assume $F_t > 0$ and $NX_t = 0$. This implies that the balance of payments is maintained by an accumulation of foreign reserves. As

$$I_t = \gamma Y_t + F_t,$$

where $\gamma = 1 - MPC$, the steady-state condition becomes:

$$\gamma Y_t + F_t = \phi K_t.$$

Here, we have assumed that the domestic investment rate remains unchanged, which is reasonable if one views India as a small open economy that takes the world interest rate as given. Dividing by L_t, we get:

$$\gamma y_t + f_t = \phi k_t,$$

where f_t denotes the foreign investment-per-worker ratio. Substituting $y_t = k_t^\alpha$, we get:

$$\gamma k_t^\alpha + f_t = \phi k_t.$$

In steady-state, this condition is independent of t and becomes:

$$\gamma k^\alpha + f = \phi k.$$

This gives us an implicit function $k(f)$ that tells us how steady-state capital-per-worker changes with steady-steady foreign investment-per-worker and depends on model primitives $\{\alpha, \gamma, \phi\}$.

Now note that consumption-per-capita is given by:

$$c_t = (1 - \gamma) k_t^\alpha.$$

Thus, the change in welfare (in consumption equivalent terms) due to a change in foreign investment-per-worker (f) is given by:

$$\Delta W = \frac{k(f^{pre} + \Delta f)^\alpha}{k(f^{pre})^\alpha} - 1.$$

■

Now note that an estimate for f^{pre} can be obtained from the data using the following expression:

$$f^{pre} = \frac{\text{FDI} + \text{Portfolio investment}}{\text{Total number of workers}}.$$

Furthermore, the change in f resulting from the policy intervention is given by:

$$\Delta f = \frac{F^{post}}{L^{post}} - \frac{F^{pre}}{L^{pre}}.$$

As $L^{pre} = L^{post} = L$ in steady-state, this simplifies to:

$$\Delta f = \frac{\Delta F}{L}.$$

By multiplying and dividing the right-hand side by F^{pre}:

$$\Delta f = dF \times f^{pre},$$

where $dF \equiv (F^{post} - F^{pre})/F^{pre}$. The value of dF is estimated from the DiD analysis, while f^{pre} is directly calculated from the data, as described above.

Recall that our DiD analysis estimates that a one percentage point increase in foreign ownership leads to a 2.5 percent decrease in capital expenditure. The average foreign ownership share among firms in our sample is 17.57 percent. Accordingly, the average effect of the policy change on capital expenditure is approximately -44 (=17.57×-2.5) percent. In 2012, the combined total of foreign direct investment and foreign institutional investment in India amounted to approximately $50 billion, while the total population was around 1.3 billion. This yields an estimate of:

$$f^{pre} = \frac{F^{pre}}{L} = \frac{50}{1.3} = 38.5.$$

Given that:

$$\Delta f = dF \times f^{pre} = -0.44 \times 38.5 = -16.9,$$

we infer that:

$$f^{post} = f^{pre} + \Delta f = 21.6.$$

India's savings rate in 2012 was approximately 30 percent of GDP, implying that the $MPC = 0.7$. We set the capital share of output at $\alpha = 0.4$ and the depreciation rate at $\phi = 0.05$. Given these parameters, we compute the capital stock corresponding to the pre- and post-policy levels of foreign capital as $k(f^{pre}) = 859$ billion USD and $k(f^{post}) = 504$ billion USD. The associated welfare loss due to the decline in foreign capital, reflecting reduced commitment, is therefore estimated as:

$$\Delta W = \left(\frac{k(f^{post})}{k(f^{pre})}\right)^{\alpha} - 1 = \left(\frac{504}{859}\right)^{0.4} - 1 \approx -0.19,$$

implying a welfare loss of approximately 19 percent.

E Details on Estimation Procedure

E.1 Proof of Proposition 1

Let $\mathcal{E}_{\beta,k^f}$ denote the economy with discount factor β and foreign capital k^f, and let $\bar{U} \equiv U(c_1 + c_2, l)$. Sustainability in $\mathcal{E}_{\beta,k^f}$ gives

$$\bar{U} \;\geq\; (1-\beta)\, U^d(k; k^f) + \beta\, U^s.$$

In the $k^f = 0$ economy define $\Phi(\beta') \equiv (1-\beta')U^d(k;0) + \beta' U^s$. As $U^d(k;0) > U^s$, $\Phi'(\beta') = U^s - U^d(k;0) < 0$, so Φ is strictly decreasing and hence invertible on $[0,1]$. Choose $\tilde{\beta}$ to solve

$$(1-\tilde{\beta})U^d(k;0) + \tilde{\beta}U^s = (1-\beta)U^d(k;k^f) + \beta U^s.$$

Since $U^d(k;k^f) \geq U^d(k;0) > U^s$, $\tilde{\beta} \leq \beta$ with strict inequality when $U^d(k;k^f) > U^d(k;0)$. Thus, $\bar{U} \geq (1-\tilde{\beta})U^d(k;0) + \tilde{\beta}U^s$, establishing sustainability in $\mathcal{E}_{\tilde{\beta},0}$. Uniqueness follows from strict monotonicity of Φ.

E.2 Proof of Proposition 2

Lemma 1 *For any (c_2, l, τ) satisfying $0 \leq \tau \leq 1$ and the intratemporal optimality condition*

$$-\frac{U_l(\omega - k + c_2, l)}{U_c(\omega - k + c_2, l)} = 1 - \tau, \tag{E.6}$$

there exists a $\delta \in [0,1]$ that satisfies both household and government budget constraints if and only if

$$g + c_2 - l \;\leq\; Rk. \tag{E.7}$$

Moreover, when (E.7) *holds the feasible δ's form the nonempty interval*

$$\delta \in \Big[\, \frac{g - \tau l}{Rk},\; 1 - \frac{c_2 - (1-\tau)l}{Rk} \,\Big],$$

whose lower bound decreases and upper bound increases with k.

Proof. From $c_2 \leq (1-\delta)Rk + (1-\tau)l$ we get $\delta \leq 1 - \dfrac{c_2 - (1-\tau)l}{Rk}$. From $g \leq \delta Rk + \tau l$ we get $\delta \geq \dfrac{g - \tau l}{Rk}$. A δ exists with $0 \leq \delta \leq 1$ iff the lower bound does not exceed the upper bound, i.e.

$$\frac{g - \tau l}{Rk} \;\leq\; 1 - \frac{c_2 - (1-\tau)l}{Rk} \quad\Longleftrightarrow\quad g + c_2 - l \;\leq\; Rk,$$

which is (E.7). Monotonicity of the bounds in k is immediate. ■

Lemma 2 *$U^d(k)$ is strictly increasing in k.*

Proof. Fix $k' > k$. Let $(\delta^*, \tau^*, c_2^*, l^*)$ be an optimizer at k. By Lemma 1, feasibility at k implies $g + c_2^* - l^* \leq Rk$. Define, for any small $\Delta \in (0, k' - k]$,

$$c_2^\Delta \equiv c_2^* + R\Delta, \qquad l^\Delta \equiv l^*, \qquad c^\Delta \equiv \omega - k' + c_2^\Delta = (\omega - k + c_2^*) + (R-1)\Delta.$$

Then

$$g + c_2^\Delta - l^\Delta = g + c_2^* - l^* + R\Delta \;\leq\; Rk + R\Delta = Rk',$$

so by Lemma 1 there exists $\delta^\Delta \in [0,1]$ such that both budget constraints hold at k' with $(c_2^\Delta, l^\Delta, \tau^\Delta)$ for any τ^Δ satisfying the intratemporal condition

$$-\frac{U_l(c^\Delta, l^\Delta)}{U_c(c^\Delta, l^\Delta)} \;=\; 1 - \tau^\Delta.$$

Because U is C^1, $U_c > 0$, $U_l < 0$, and (c^Δ, l^Δ) is a small perturbation of $(\omega - k + c_2^*, l^*)$ when Δ is small, we have $0 < \tau^\Delta < 1$ for all sufficiently small $\Delta > 0$ (continuity of the MRS mapping). Therefore $(\delta^\Delta, \tau^\Delta, c_2^\Delta, l^\Delta)$ is implementable and feasible at k'.

Finally, since $c^\Delta = (\omega - k + c_2^*) + (R-1)\Delta$ and $l^\Delta = l^*$,

$$U(\omega - k' + c_2^\Delta, l^\Delta) = U\big(c^\Delta, l^*\big) > U\big(\omega - k + c_2^*, l^*\big) = U^d(k),$$

for all sufficiently small $\Delta > 0$, because $R > 1$ and U is strictly increasing in c. Taking the supremum over all feasible choices at k' yields $U^d(k') > U^d(k)$. ■

Lemma 3 *$k^d(\beta)$ is strictly increasing in β.*

Proof. Define the sustainable set $\mathcal{S}(\beta) \equiv \{k \geq 0 : \; U^d(k) \leq L(\beta)\}$, where $L(\beta) \equiv U^s + \frac{U(\omega - k + c_2, l) - U^s}{1-\beta}$. By Lemma 2, $U^d(k)$ is strictly increasing in k. Moreover, note that $L(\beta)$ is strictly increasing in β as $L'(\beta) = \frac{U(\omega-k+c_2,l)-U^s}{(1-\beta)^2} > 0$. Hence, for $\beta_2 > \beta_1$, we have $\mathcal{S}(\beta_2) \supset \mathcal{S}(\beta_1)$ with strict inclusion. Because welfare is increasing in total consumption and the resource frontier is increasing in k (Lemma 1), the stationary discretionary choice satisfies $k^d(\beta) = \sup \mathcal{S}(\beta)$, implying $k^d(\beta_2) > k^d(\beta_1)$. ■

Finally, note that as k^c is independent of β and strictly larger than $k^d(\beta)$ $\forall \beta$, $\Delta_k(\beta) \equiv \big(k^c - k^d(\beta)\big)/k^c$ is strictly decreasing in β.

E.3 Proof of Proposition 3

Step 1 (Capital return). Under commitment, the Ramsey capital-tax wedge satisfies

$$\delta^c = \frac{R-1}{R},$$

which uniquely determines $R = 1/(1-\delta^c)$ from the observed capital-tax rate.

Step 2 (Expenditure shares and levels). At the commitment allocation $c_1^c = 0$ and $k^c = \omega$, implying

$$\omega = s_I y^c, \qquad g = s_G y^c, \qquad c_2^c = s_C y^c,$$

with $s_C + s_I + s_G = 1$. Thus, given (s_I, s_G, τ^c, R), the household and government budget constraints,

$$c_2^c = \omega + (1-\tau^c) l^c, \qquad g = (R-1)\omega + \tau^c l^c,$$

jointly determine c_2^c and hours l^c.

Step 3 (Preference weight γ and labor endowment $\bar{l}$). The intratemporal first-order condition for labor supply under commitment implies

$$(1-\tau^c) = \frac{\gamma(\bar{l} - l^c)^{\alpha-1}}{(c_2^c)^{\alpha-1}}.$$

Given (c_2^c, l^c, τ^c), the composite $\gamma(\bar{l} - l^c)^{\alpha-1}$ is identified. Fixing $\bar{l}$ then yields γ directly.

Step 4 (Discount factor β). Holding the preceding parameters fixed, the discretionary steady-state capital stock $k^d(\beta)$ is implicitly defined by the binding sustainability constraint. By Lemma 3, $k^d(\beta)$ is strictly increasing in β; thus, the observed contraction $\Delta_k = (k^c - k^d(\beta))/k^c$ uniquely inverts to a value of β.

Step 5 (Jacobian rank). The mapping from parameters to moments is triangular:

$$\delta^c \mapsto R, \qquad (s_I, s_G, \tau^c; R) \mapsto (\omega, g, l^c, c_2^c), \qquad (\tau^c, c_2^c, l^c) \mapsto \gamma, \qquad \Delta_k \mapsto \beta.$$

Each sub-mapping is continuously differentiable and locally injective, so the Jacobian $D_\theta m(\theta_0)$ has full rank, establishing local identification.