Offshore Activities and Financial vs Operational Hedging

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ABSTRACT

A key question is why many multinational firms forgo foreign exchange derivative (FX) hedging and instead use operational hedging. We propose an explanation based on illiquidity and the unique advantages of operational hedges. We use 10-K filings to construct dynamically updated text-based measures of the offshore sale of output, purchase of input, and ownership of assets. We find that firms use FX derivatives when they are liquid and generally available. Otherwise, they often favor purchasing input from the same nations they sell output to, an operational hedge. Quasi-natural experiments based on new derivative product launches suggest a likely causal relation.

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1. Introduction

Existing research has a difficult time explaining why many firms with global activities do not hedge using foreign exchange derivatives. For example, Guay and Kothari (2003) state "corporate derivatives use appears to be a small piece of non-financial firms' overall risk profile. This suggests a need to rethink past empirical research showing the importance of firms' derivative use." Because unwanted risk can expose firms to additional distress costs, financial constraints, or under investment,[1] most firms do have incentives to hedge. This paper suggests that foreign exchange derivative hedging (henceforth FX hedging) is not used in some cases due to illiquidity costs, and because a novel form of operational hedging might be more attractive. In particular, we show that firms can hedge using operations by ramping up purchases of production inputs from the same nations they sell their output to. This novel form of operational hedging is economically important, is a key focus of our paper, and has not been discussed in the existing literature.

Our paper highlights the importance of operational hedges when standard FX derivatives are illiquid. We find that many derivatives are illiquid or are not even exchange-traded during our sample period from 1997 to 2011. Material illiquidity can create frictions in the decision to hedge. The literature also suggests that FX derivatives might not work well for long term projects (Kim, Mathur, and Nam, 2006), or that they are less effective when demand uncertainty (quantity risk) is high (Chowdhry and Howe, 1998).[2] The literature also suggests that dynamic hedging, which uses exotic derivatives and high frequency rebalancing, can hedge both price and quantity risk (Kroner and Sultan, 1993; Brown, 2001; Brown and Toft, 2002). We show that operational hedging is likely most effective when both static and dynamic FX hedging are less effective or are too costly. For example, we find that operational hedging is more prevalent in subsamples in which the net benefits of operational hedging are particularly high. In all, our evidence is consistent with firms using both FX derivatives and operational hedging in a broader "portfolio approach" to risk management, as each tool can

[1] See Smith and Stulz (1985) and Froot, Scharfstein, and Stein (1993).

[2] Brown and Toft (2002) describe this as hedgeable (price) and unhedgeable (quantity) risks.

be more or less ideal in different markets.

Consistent with our empirical framework, the theoretical model in Tuzel and Zhang (2016) predicts that the overseas sale of output generates pro-cyclical risk exposure, and the purchase of input from the same nations is counter-cyclical and is a hedge.[3] Hoberg and Moon (2014) find supporting evidence as firms selling output abroad have higher expected returns, consistent with exposure, and firms buying input abroad have lower expected returns, consistent with hedging properties.[4] These studies motivate our central hypothesis: in markets in which FX hedges are illiquid or less effective, firms will consider operational hedging as a strong substitute. We also note that operational hedging does not preclude offshoring for other economic reasons (e.g., tapping low cost inputs or labor). Rather, on the margin, our results suggest that the benefits of operational hedging also contribute to a firm's decision making process.

The intuition regarding the operational hedge is exemplified by BMW in a recent article:

> BMW took a two-pronged approach to managing its foreign exchange exposure. One strategy was to use a "natural hedge" - meaning it would develop ways to spend money in the same currency as where sales were taking place, meaning revenues would also be in the local currency. However, not all exposure could be offset in this way, so BMW decided it would also use formal financial hedges. [. . .] The natural hedge strategy was implemented in two ways. The first involved establishing factories in the markets in which it sold its products; the second involved making more purchases denominated in the currencies of its main markets. (Financial Times, 2012)[5]

BMW's example shows that the company views (A) purchasing inputs, and (B) operating plants in nations in which sales are realized as valid operational hedges. These strategies are complementary to (C) the use of FX derivatives. Our study suggests that (A) is the more

[3]Tuzel and Zhang (2016) focus on operations in multiple U.S. locations, but the predictions can be generalized in an international setting.

[4]See Chan, Karolyi, and Stulz (1992) for early evidence of an international risk premium and Karolyi and Stulz (2003) for a review of the international asset pricing literature.

[5]Financial Times (October 29, 2012), "The case study : How BMW dealt with exchange rate risk" by Xu Bin and Liu Ying.

effective of the two operational hedging strategies. However, we find some evidence that (A) is more cost effective when it is done alongside (B),[6] as is the case for BMW. In particular, using both together can minimize transportation cost while maximizing hedging benefits.

We employ three different empirical settings to examine the link between FX hedging and the use of purchasing inputs as an operational hedge. First, we consider a measure of FX derivative market liquidity based on exchange trading. We find that operational hedging strategies increase when liquidity deteriorates. Second, we consider a measure of the efficacy of FX hedging given that demand uncertainty is heterogeneous across nations. We find that operational hedging increases when FX hedging efficacy decreases. Although we include numerous controls and rigid fixed effects to mitigate the impact of omitted variables, these initial tests do not fully establish causality. Hence, we consider quasi-natural experiments based on shocks to FX hedging liquidity following new derivative product launches by the Chicago Mercantile Exchange (CME). Our results uniformly support the conclusion that improved FX derivative liquidity likely causes substitutions away from operational hedging and toward FX hedging, and these hedges are indeed partial substitutes. These results are also stronger in subsamples in which hedging incentives are stronger.

Because the purchase of input from offshore sources not only serves as a hedge, but also entails economic activity with its own net present value, it is natural to ask whether our results are due to this non-hedging motive. There are two reasons why the hedging channel is more likely. First, we predict and find that only offshore input that is not bundled with the ownership of assets (external input) is strongly negatively related to both FX derivative liquidity and efficacy. The hedging motive predicts that these results will be weaker when offshore input is bundled with ownership of producing assets (internal input). The cost-saving motive predicts that both forms of offshore input, with and without ownership of assets, should be positively linked to FX liquidity, as economic activity should associate with improved liquidity. We instead find the negative link predicted by the hedging explanation, and we further confirm that this link only obtains for the most effective operational hedge (external input). Second, we find strong results in our main difference-in-differences (DD)

[6] See Section 6.4 and row one of Table 11.

test using quasi-natural experiments, in which only the cost of FX hedging is shocked.

Our quasi-natural experiments consider a DD approach that examines the use of operational hedging before and after the launch of new FX derivatives by the CME. These tests are discriminating because only a subset of nations are affected by the launch of each new product, and because these new product launches occur on four distinct dates: 1999, 2002, 2006, and 2009. We find the predicted result that improved liquidity and availability of FX derivatives resulted in a decrease in the use of operational hedging. The economic magnitudes of the estimated DD effects are significant: new CME product launches decrease the likelihood of external input by treated firms to the affected nations by 0.7 to 0.8 percentage points, which is an economically large 10% drop from the average level of external input in the affected nations prior to the shocks. At the same time, textual mentions of FX derivatives by treated firms increase by 15.6% to 17.1%, which translates as an approximately 0.2 more textual paragraphs. These findings support the conclusion that the link between FX hedging liquidity and the use of operational hedging is likely causal.

Our DD approach has two limitations. First, the launch of FX derivative products might coincide with a latent economic shock that causes the CME product launch, and at the same time, *reduces* the incentive to participate in offshore activities. We note that such a shock is unlikely to explain our findings, however, as new FX products are more likely to be launched when there is *more* (not less) incentive to do business with treated nations. Also less consistent with this alternative is that we specifically find less offshore purchase of input from treated nations when it is not bundled with producing assets, which is the activity most directly predicted to diminish under the operational hedging hypothesis. The second limitation is that the majority of corporate FX derivative contracts are traded in OTC markets, and not on the CME. Hence, it was possible to buy FX derivatives before the launch of the new CME products. However, this limitation is offset by the fact that visible trading of contracts on the CME, plus the possibility of profitable cross-market arbitrate, should create direct liquidity spillovers for the OTC markets.[7] Moreover, if trading on the CME was irrelevant, then we should find no empirical results, and yet we find strong results.

[7] See Dale (1981) for a discussion of hedging effectiveness in currency futures markets.

Our paper makes several contributions. First, we present new operational hedging hypotheses where firms purchase input from the same nations they sell their output to. Our focus on the distinction between external versus internal input, notably, is not developed in the literature. Second, we use computational linguistic methods to identify FX hedging and offshore activities using a time-varying firm-nation-year network. This network, which should be useful to a broader set of research questions, identifies three types of offshoring activities (the sale of output and the purchase of input with and without ownership of assets) to more than 200 nations in each year from 1997 to 2011. Third, we present strong evidence supporting the hypothesized role of operational hedging using strict firm and nation fixed effects, and quasi-natural experiments.

2. Literature and hypotheses

Many early studies examine the value of corporate hedging in general.[8] Other studies focus on measuring the extent of currency risk exposure, and then assess the effectiveness of FX hedging.[9] Overall, FX hedging is seen in the literature as the standard method of hedging against foreign exchange-rate exposure.[10] The literature also explores the incentives to hedge. Most seminal are the incentives to minimize dead weight distress costs (Smith and Stulz, 1985) and to avoid potential underinvestment (Froot, Scharfstein, and Stein, 1993).

A more recent literature focuses on operational hedging and its comparative advantages relative to FX hedging.[11] However, no existing studies examine the role of operational hedging in the form of purchasing inputs or owning foreign assets in the same nations in

[8]See Smith and Stulz (1985), Froot, Scharfstein, and Stein (1993), DeMarzo and Duffie (1995), Haushalter (2000) and Graham and Rogers (2002) among others.

[9]See Jorion (1990), Amihud (1994), Bodnar and Gentry (1993), Bartov and Bodnar (1994), Bartov, Bodnar, and Kaul (1996), Choi and Prasad (1995), Chow, Lee, and Solt (1997), He and Ng (1998), Griffin and Stulz (2001), and Dominguez and Tesar (2006).

[10]See, e.g., Nance, Smith, and Smithson (1993), Geczy, Minton, and Schrand (1997), Allayannis and Weston (2001), Allayannis and Ofek (2001), and Brown (2001).

[11]See Logue (1995), Chowdhry and Howe (1998), Allayannis, Ihrig, and Weston (2001), Pantzalis, Simkins, and Laux (2001), Williamson (2001), Dewenter, Higgins, and Simin (2005), Kim, Mathur, and Nam (2006), Bartram and Bodnar (2007), Bartram, Brown, and Minton (2010), Bodnar, Dumas, and Marston (2002), Hankins (2011), Hutson and Laing (2014). Muller and Verschoor (2006) provide a detailed review.

which a firm sells its output. Our paper presents this new operational hedging hypothesis, and also provides a methodological contribution needed to fully test the hypothesis.

2.1. The role of purchasing overseas input

The effectiveness of purchasing input as an operational hedge is intuitively explained by example. Consider a U.S. firm selling widgets in India. This firm receives sale proceeds in Rupees, and faces exchange rate risk when it converts the Rupees back to dollars to pay dividends to its shareholders who consume in dollars. Derivatives on the Rupee-Dollar exchange rate can hedge this risk by locking in the exchange rate ex-ante. Operational hedging in the form of purchasing inputs from sources in India rather than from domestic sources will also hedge this risk. In particular, the prices of both output sold and input purchased are positively exposed to Rupee-Dollar risk. As one is an inflow and the other is an outflow, it follows that the purchase of input strongly hedges the sale of output. The theoretical model of Tuzel and Zhang (2016) further amplifies this predicted hedging relation, as input prices will decline when the offshore nation enters a period of contraction.

In our first hypothesis, we consider the role of FX derivative liquidity and hedging efficacy as potential drivers of hedging strategies. The impact of liquidity is intuitive as poor liquidity raises the cost of FX derivatives and induces firms to substitute toward operational hedges. Regarding efficacy, most scholars take it as given that FX derivatives can effectively hedge exchange rate uncertainty. However, the model in Chowdhry and Howe (1998) shows that operational hedges are more optimal "when both exchange rate uncertainty and demand uncertainty are present."[12] Extending our example, the intuition is that the size of the needed hedge (the amount of Rupees received from widget sales) will naturally scale with the amount of inputs needed for production. If the firm sells fewer widgets, it will in turn need fewer inputs. Our proposed operational hedge thus exemplifies the logic in their model, and illustrates why natural scaling can make operational hedging more effective than FX

[12]One might argue that demand uncertainty (quantity risk) might be less salient as firms can control the quantity they produce. However, we note that optimal quantity choices are strongly influenced by customer demand, which has stochastic drivers outside the firm's control.

hedging when demand uncertainty is high.

Hypothesis 1: Firms have incentives to do more FX hedging when the market for FX derivatives is more liquid, and when FX derivatives have greater efficacy in hedging both exchange rate and demand uncertainty. In contrast, firms will favor operational hedging in the form of offshore external input when FX derivatives are less liquid or less effective.

We later show that FX derivative illiquidity is quite material in some markets, and some contracts were not even exchange-traded during parts of our sample.

2.2. The role of ownership of overseas assets

We next consider the role of ownership of producing assets that is often bundled with the purchase of inputs. The production-based equilibrium model in Tuzel and Zhang (2016) predicts that offshore asset values will be pro-cyclical, thus weakening the counter-cyclical benefits of the purchase of input. Also relevant, unlike offshore input purchases, asset ownership does not naturally scale with the size of the needed hedge as hard assets are generally fixed in size. This motivates our second hypothesis.

Hypothesis 2: The predicted link between FX hedging and offshore external input operational hedging in Hypothesis 1 does not necessarily extend to offshore internal input.

2.3. Operational hedging costs and benefits

Aforementioned theory suggests that operational hedges are strong alternatives to FX hedging. Yet they are not perfect substitutes for two reasons. First, they entail a change in a firm's operations that can influence expected profits. Second, given a firm's broader characteristics and its overall global footprint, the incentives to hedge using operations are stronger for some firms than for others. These two factors generate more refined predictions.

In particular, when an operational hedge is associated with stronger incentives (i.e., it has more added benefits and fewer costs), then it is more likely on the margin that we will observe the firm choosing the given activity because of its hedging properties. In contrast, when these incentives are low, it is more likely that the firm chose the given activity due to its non-hedging properties. In the latter (former) case, the given activity will be less (more) sensitive to shocks to FX hedging cost. This motivates our final hypothesis.

Hypothesis 3: The predicted link between FX and operational hedging in Hypothesis 1 will be stronger in subsamples in which the net benefits of operational hedging are large.

We note four cases in which, on the margin, additional incentives favor operational hedging over FX hedging: (1) when offshore investments are longer-term and less reversible (Kim, Mathur, and Nam, 2006), (2) when the nation's distance is smaller (less costly to manage operations), (3) when the firm's input cost is large relative to its revenue (COGS/sales) (the operational hedge can be easily scaled to full force), and (4) when the nation's FX derivatives are ineffective in hedging demand uncertainty (Chowdhry and Howe, 1998).

A final prediction is that when competition or financial constraints are intense, firms favor precautionary policies and thus have more incentives to hedge in general (see, e.g., Hoberg, Phillips, and Prabhala (2014) and Froot, Scharfstein, and Stein (1993), respectively). Therefore, firm policies should also be more sensitive to hedging motives in these markets.[13]

3. Data and variables

We collect and electronically process offshoring data and financial hedging data from the SEC's Edgar 10-K filings. We utilize software provided by metaHeuristica LLC for parsing the text documents.[14] We then merge the database with the Compustat data using the SEC Analytics table for Central Index Key (CIK) to gvkey links. Our sample period covers from 1997 to 2011, as 1997 is the first year of full electronic coverage of 10-K filings in the SEC Edgar database. As basic screens, we discard firms with a missing SIC code or a SIC code

[13] One exception to this prediction is noted in Rampini and Viswanathan (2010), who predict less hedging when financial constraints are specifically due to collateral constraints. In additional analysis in our Online Appendix, we find support for the classic precautionary view when constraints are unrelated to collateral constraints. However, we do find support for this exception when collateral constraints are likely present.

[14] Our paper contributes to a growing literature that considers text-based analysis to test theoretical hypotheses in Finance. Early financial studies using text analysis include Antweiler and Frank (2004) and Tetlock (2007). Regarding SEC disclosures, earlier work includes Hanley and Hoberg (2010), Hoberg and Phillips (2015), Loughran and McDonald (2011) and Garcia and Norli (2012). See Sebastiani (2002) for a review of text analytic methods.

in the range of 6000 to 6999 and 4900 to 4949 to exclude financials and regulated utilities, respectively. We also require that each firm has a valid CIK to gvkey link. Additionally, we drop nations that use another nation's currency as their legal tender or nations that have official or unofficial fixed peg to US dollars during our sample period in our regression analyses.[15] These nations are dropped because a peg to the dollar indicates a diminished or non-existent role for currency conversion risk, the central topic of this paper.

3.1. Offshoring data and variables

We first compile a complete list of *nation words* for 236 nations, considering variations that include official and non-official nation names and their adjective forms. Then, we create another extensive list of the nearest neighbor words that co-exist with nation words from 10-K filings in the base-year 1997. Nearest neighbor words are those that occur within a 25-word window of any of the nation words. We then manually categorize all roughly 5,000 nearest neighbor words that are mentioned more than 100 times to determine whether the word refers to any of the following offshoring activities: A) Output, B) External input, and C) Internal input. For example,"Sell", "Sales", "Revenues", "Markets", "Consumers", "Store", "Export" and "Distribute" are regarded as A) Output. "Supplier", "Vendor", "Subcontract", "Import" and "Purchase & From" are regarded as B) External input. C) Internal input include "Subsidiary", "Facility", "Plant", "Venture", "Factory" and "Warehouse" for example.[16] We refer to the full list as *offshore words* throughout the paper. In Appendix A, we report the complete list of words for each activity.

We then reexamine all 10-K filings in the base-year 1997 and extract all paragraphs that contain words from both lists: nation words and offshore words. Our approach to extract paragraphs instead of sentences intends to reduce false negatives. This choice is due to the

[15]Those nations include Angola, Bahamas, Bahrain, Barbados, Belarus, Belize, China, Cuba, Djibouti, El Salvador, Hong Kong, Jordan, Marshall Islands, Lebanon, Oman, Panama, Qatar, Saudi Arabia, United Arab Emirates, Venezuela, and Vietnam.

[16]Some input words that are not explicitly identified as either external input or internal input such as "Manufacture" and "Produce" are regarded as D) Indeterminate input, as the subject of the paragraph is not clear in these cases.

fact that many firms discuss their offshoring activities over several sentences, and hence just one sentence often misses pairings of nation words and offshore words. Our paragraph approach can generate false positives. To address this issue, we set a maximum distance between nation words and offshore words at 25 words, and drop hits when the two words are more than 25 words apart even if they are in the same paragraph.[17] We then assess success rates based on whether each hit correctly identifies one of the three offshoring activities using ten separate random samples of 1% of all observations in our 1997 database. Manual validation reveals that our success rate ranges from 75% to 90%.[18]

Our final step is to run our methodology for all 10-K filings from 1997 to 2011. This generates a full panel of offshoring data with 293,050 observations with the raw counts of how many times a given firm mentions any of the offshoring activities in each nation. Our final sample is reduced to 195,651 observations in which we observe non-zero offshore output activity. We focus on this reduced sample of offshore output activity because we are interested in examining how firms hedge the risk that their offshore sales might expose them to, and hence these are the observations that entail a material hedging decision.

We focus on the following three offshoring variables: External Input Dummy, Internal Input Dummy, and Relative External vs Internal. External Input Dummy and Internal Input Dummy are one if the firm discusses offshore external and internal input, respectively, using the relevant vocabulary in our offshore word lists along with a given nation word in a given year. Relative External vs Internal is computed as External Input Dummy divided by the sum of both External Input Dummy and Internal Input Dummy. By explicitly contrasting external versus internal input activities, this measure directly assesses the extent to which the firm engages in external input relative to internal input. This variable cannot be computed for observations that do not have either external or internal input activities.

[Insert Fig. 1 Here]

[17] We also consider and manually inspect alternatives such as 5, 15, 30 and 50 words and note that the distance of 25 words is most accurate.

[18] As an additional quality check, we examine paragraphs that contain nation words but no offshore words, and confirm that nearest neighbor words associated with nation words in these cases are not related to offshoring. For example, such unrelated discussions mention words such as "University", "Patent", "Carry-forwards", "Airlines" and "Court".

Fig. 1 graphically illustrates U.S. firms' offshoring activities around the world. We construct an intensity measure for each offshoring activity including output, external input, and internal input using the percentage of firms that offshore with a given nation. Darker shades indicate greater intensity. Fig. (a) displays the map of counter-party nations in which the firms in our sample offshore their output over our sample period. Fig. (b) and (c) depict the maps of the counter-party nations experiencing the most offshoring external and internal input respectively over our sample period. Fig. (a) shows that outputs are primarily sold to Canada, United Kingdom, Japan, and China. In Fig. (b) and (c), we observe that Latin America, Europe and Asia are regions in which U.S. firms do offshore input operations. Fig. (b) shows that U.S. firms significantly rely on sources in southeast Asia to obtain external input. Fig. (c) shows that U.S. firms do more internal input than external input in Latin America and Europe, possibly due to their geographical proximity.

3.2. Validation of offshoring data

In this section, we validate the quality of information contained in our dynamic network of firm-nation offshoring activities. We do so by examining the properties of the network as compared to external data sources. We first consider foreign trade as reported by the U.S. Census Bureau, the official source for nation-by-nation U.S. exports and imports. Monthly and annual total exports and imports by all U.S. entities are available from 1985 to present.[19] Although Census foreign trade data are accurate representations of offshoring activities by U.S. entities, we note that the figures include both private and public firms in the U.S., as well as U.S. government shipments of goods. Therefore, aggregations from our sample of Compustat firms that have machine readable 10-Ks, are not expected to fully correlate with the Census totals. However, we believe there is ample overlap such that the Census data can offer a strong validation test for our offshoring data.

Table 1 displays two separate lists of the top 50 nations, one from the Census trade data and the other from our offshoring network, over the three five-year periods, 1997-2001,

[19]We use annual total exports and imports from the following data file: https://www.census.gov/foreign-trade/balance/country.xlsx.

2002-2006, and 2007-2011. Panel A compares Census exports and our corresponding offshore output measure, and Panel B compares Census imports and our offshore input measure.

[Insert Table 1 Here]

In Panel A, the top five counter-party nations (e.g., Canada, Japan, China, United Kingdom, and Mexico) are at the top of both the Census list and our list. However, the order of the five nations are slightly different. As previously stated, this small disagreement is likely because the Census trade data cover both private and public firms as well as the U.S. government. We also observe similar changes in both lists from the early period to the later period. For example, China exhibits a rise in its ranking as a counter-party nation in both Census exports and our offshoring output variable. It is also worth noting that the Netherlands ranks highly in the Census list but not as high in our list. This difference is justifiable as the Netherlands is a transfer point for shipped goods given its large ports. The Census might log these shipments as exports to the Netherlands, but the firms in our sample would disclose in their 10-Ks that some of these goods are being consumed elsewhere in Europe. Overall, the correlation coefficient between Census exports and the number of textual mentions of offshore output from our database is 0.85 with a p-value of 0.0000.

In Panel B, we also observe significant overlap in both Census imports and our offshoring input textual mentions. The correlation coefficient between Census imports and the number of textual mentions of offshore input is slightly greater compared to Panel A at 0.88 with a p-value of 0.0000. These strong results from the comparison with the U.S. Census data provide a strong initial confirmation that the information in our data is of high quality.

Next, we consider a second validation test that uses exposures to foreign stock market returns and exposures to changes in exchange rates. The prediction is that firms with more offshore sales in a given nation will have more exposure to its exchange rate changes, and those with more external input in the given nation will have less exposure, a direct prediction of our hedging hypothesis. As discussed in Section 2, Chowdhry and Howe (1998) further motivate that operational hedges can hedge not only exchange risk, but also demand uncertainty in the given nation. Because shifts in demand are a primary driver of stock prices, and because demand uncertainty can be long-term in nature, it follows that firms with more offshore sales (external input) in a given nation should have higher (lower) exposures to the given nation's stock market returns.

[Insert Table 2 Here]

In Panels A and C of Table 2, we consider a balanced panel sample that includes all firm-nation-year observations regardless of whether the firm has offshore output activities in the given nation in a given year. By using this extended sample, we can compare a firm with offshore output activities in a given nation against a stronger counterfactual firm that does not sell output to the nation. In Panels B and D, we use our original unbalanced sample that excludes any firm-nation-year observations that are not associated with offshore output activities. The dependent variable in Panels A and B is the annual firm-nation stock market beta, the slope of a regression of each firm's monthly stock return on a given nation's monthly stock market index return. The dependent variable in Panels C and D is an analogous beta based on the given nation's exchange rate changes.

We regress these nation-specific betas on our three nation-specific offshoring variables: Offshore Output Dummy, External Input Dummy and Internal Input Dummy. In addition to the dummy variables, we also consider relative intensity for each activity in each nation: Offshore Output Fraction, External Input Fraction and Internal Input Fraction. These intensities are computed as the number of times the given activity in a given nation is mentioned, divided by the total number of firm mentions of the given activity for all nations. We further stress test our results by including a control for the U.S. market beta. This neutralizes any standard association between foreign market betas and domestic market betas. All regressions also include firm and year fixed effects.

We find in the first column of Panel A that the foreign stock market beta is significantly and positively associated with offshore output activity to the given nation. The output fraction in column four reinforces this point by showing that the greater the output intensity to the given nation, the stronger is the association between the firm's stock returns and the nation's stock market beta. Analogously in columns one and four of Panel C, we find that the exchange rate beta is also significantly and positively associated with offshore output to the nation, although the association is weaker than those for the stock market betas. These findings illustrate support for the predictions of Chowdhry and Howe (1998) in our international setting. In particular, the long-term aspects of hedging, and the aspects relating to demand uncertainty, are empirically important.

We next explore whether offshore input activities differ in their associations with the stock market and exchange rate betas. In column two, we find that internal input activities generally exhibit a significantly positive relation with the stock market beta, and an insignificant relation with the exchange rate beta. As discussed in Section 2, we do not have a strong prediction for internal input because this activity bundles the counter-cyclical purchase of inputs with pro-cyclical ownership of assets. The results suggest that the pro-cyclical force might be the dominant force in this setting.

In contrast, column three shows that external input activities (in all panels except Panel D) are significantly and negatively related to both betas. This finding is important, and not only validates the quality of our dynamic offshoring network, but it also supports the central prediction of our operational hedging hypothesis. In all, our results support the conclusion that our firm-nation network is highly informative about the portfolio of offshore activities of U.S. firms. These two validations are based on distinct external data sources, indicating that these tests are strong and are not biased by in-sample features of the data.

3.3. Financial hedging data and variables

We create financial hedging variables by searching 10-Ks for statements that indicate the use of FX derivative products. We consider searches based on the following three word lists: (A) “Currency” or “Foreign Exchange”, (B) “Forward”, “Future”, “Option”, “Swap”, “Spot”, “Derivative”, “Hedge”, “Hedging”, or “Hedged”, and (C) “Contract”, “Position”, “Instrument”, “Agreement”, “Obligation”, “Transaction”, or “Strategy”. To conclude that a firm uses FX hedging, we require that the firm mentions at least one word from each of these lists (or their plural forms if they are nouns) in close proximity within a paragraph.

As before, we extract paragraphs instead of sentences and set the same maximum distance between words from the three lists at 25 words.[20]

Our use of specific derivative terms in (B) above allows us to further distinguish between different types of derivatives. We separately consider three categories: (1) all types of derivatives, (2) futures and forwards contracts only, and (3) futures contracts only. We focus on futures and forwards specifically because our quasi-natural experiments are based on direct shocks to exchange-traded derivatives. Exchange traded contracts are mainly futures, but these should also further spill over to the OTC contracts, which are mainly forwards. Also, we note that firms sometimes discuss FX interest rate derivatives using a subset of the words in the above lists. We thus consider an even more conservative measure that further excludes hits that contain "interest rate(s)".

Our text-based approach is stable because our sample period starts in 1997, and FASB issued SFAS No 119, *Disclosure about Derivative Financial Instruments and Fair Value of Financial Instruments*, in October 1994. This rule requires firms to disclose their use of derivative instruments - futures, forwards, swaps, options, and other financial instruments with similar characteristics.[21] Earlier studies using this approach to identify FX hedging include Wong (2000), Graham and Rogers (2002), and Kim, Mathur, and Nam (2006).

We create the following two variables: FX Hedging Dummy and Log(1+#FX Hedge). The former is one if a firm discloses its use of any FX derivative products in its 10-K in a given year. Log(1+#FX Hedge) is the natural logarithm of one plus the raw count of how many times a firm mentions FX derivatives in a given year. These variables are firm-year level observations from 1997 to 2011. The dimensionality of these panel data thus differs from the offshoring variables, which are defined at the firm-nation-year level. This is due to the fact that firms only disclose their use of currency derivative contracts, and they generally do not discuss with adequate detail the specific currencies they hedge against. Hence, when

[20] We additionally exclude hits with phrases that would make them false positives including "in the future", "forward-looking", and "not material", for example.

[21] SFAS No. 119 was effective for financial statements issued during fiscal years ending after December 15, 1994 for entities with greater than $150 million in total assets, and effective after December 15, 1995 for the entities with less than $150 million in total assets.

considering FX hedging, we limit our analysis to the firm-year level.

Although this text-based measure of FX derivatives is standard and was used by multiple existing studies (Wong, 2000; Graham and Rogers, 2002; Kim, Mathur, and Nam, 2006), we further validate this approach by hand-evaluating success rates based on random samples in which a research assistant manually assesses whether each hit correctly identifies the use of FX derivatives. This manual validation reveals that the success rate is high and ranges from 80% to 97%. Moreover, the SFAS No 119 described earlier requires that firms report their FX derivatives use, and hence the coverage of this variable is likely thorough.

For robustness, we also consider foreign currency debt. However, the use of foreign currency debt for hedging is less clear, as in many cases firms issue foreign debt because of low interest rates. Although it is difficult to separately identify when foreign debt is used for hedging purposes, we consider a robustness test assuming that all foreign currency debt issues are potentially related to hedging activities. We thus consider a financial hedging variable that includes foreign debt issues, which we obtain from the SDC (public debt) and the DealScan (private placement debt) databases. We define FX Hedging Dummy (including debt) to be one if a firm either discloses its use of any FX derivative products in its 10-K in a given year, or if it issued any foreign currency debt within the previous five years. The correlation between the FX Hedging Dummy including and excluding foreign debt is 0.68.

4. FX hedging cost and efficacy and offshore policies

In this section, we consider measures of the liquidity and efficacy of FX derivatives. We then present descriptive information. Our measure of FX liquidity is based on the currency market, as we expect the liquidity of the corresponding FX derivative market to be related to the liquidity of the currency itself.[22] Karnaukh, Ranaldo, and Söderlind (2015) measure the liquidity of spot FX rates for approximately thirty currency exchange rates based on relative bid-ask spreads. The authors show significant time-varying and cross-sectional variations in

[22] In Online Appendix Table OA.1, we consider a second measure of FX liquidity for robustness, which is the total trading volume of exchange-traded FX futures contracts. Results are similar for the two measures of FX liquidity.

currency liquidity. We obtain their monthly FX illiquidity measure for 23 nations from 1996 to 2010, and then compute the annual average of the monthly observations.[23]

Our measure of hedging efficacy, which we label FX RSQ, is based on the model in Chowdhry and Howe (1998), which suggests that FX derivatives might be less effective than operational hedges when demand uncertainty is high. For each nation, FX RSQ is the R^2 of a regression of each nation's consumption growth in US dollars on innovations in the same nation's exchange rates. We consider consumption growth because it is a measure of aggregate demand in a given nation, which (importantly given the above model) encapsulates both price and quantity demanded uncertainty.[24]

[Insert Table 3 Here]

Table 3 presents summary statistics. In our extended database, 69% of U.S. firms participate in offshoring output, and most of these offshoring firms (about 85%) do both offshore output and input at the same time. Among the firms that participate in offshoring output (our baseline sample), 25% and 72% do offshore external input and internal input, respectively. The table also presents descriptive statistics for our FX hedging variables. Fifty-five percent of firms with offshoring output disclosed the use of FX derivative contracts in their 10-Ks, and the average count of textual mentions of such contracts is 1.19. 74% of firms with offshoring output either use FX derivatives or have outstanding FX debt. We also note that our FX hedging cost and efficacy measures, FX Illiquidity and FX RSQ, vary widely

[23] The FX illiquidity data are available from Angelo Ranaldo's research data website at http://www.sbf.unisg.ch/en/lehrstuehle/lehrstuhl_ranaldo/homepage_ranaldo/research+material. We thank the authors for providing the data. The 23 nations with available FX illiquidity data are Australia, Canada, India, Japan, Mexico, New Zealand, Norway, Singapore, South Africa, Sweden, Switzerland, United Kingdom, and the 11 EMU member nations including Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain.

[24] We use consumption and exchange rate data from the World Bank from 1970 to 1995, which is two years prior to the start year of our sample period, ensuring no look ahead bias. In particular, we use the household final consumption expenditure data (current US$) that are available from the World Bank website at http://data.worldbank.org/indicator/NE.CON.PRVT.CD. We additionally require at least five years of available data. Following standard methods, we define each nation's consumption growth as the natural logarithm of its consumption in U.S. dollars in a given year divided by its lagged consumption. For robustness, we also consider a time-varying R^2 computed using a 20 year rolling window (including the years [t-2, t-22]). These results are robust. We also construct a second time-varying FX RSQ based on nation-by-nation aggregate sales of local public corporations from 1980 to 2011 from the Datastream database (DS code WS01001). These results are also robust.

across nations. Hence, we have power to examine differential hedging responses by firms as these variables change across nations or over time. FX Illiquidity has a mean of 0.122 and a standard deviation of 0.595. FX efficacy based on the regression R^2 ranges from 0% to 95.6% with the mean of 59.4% and standard deviation of 30.1%. The table also summarizes our controls for national and firm financial characteristics. To facilitate the economic interpretation of our results, we later standardize all variables prior to running regressions and winsorize all non-binary variables at the 1% and 99% levels to avoid outliers.

[**Insert Table 4 Here**]

Table 4 displays Pearson correlation coefficients between our offshoring and FX hedging variables, and nation (in Panel A) or firm (in Panel B) characteristic variables. We find that our offshoring variables correlate only weakly to moderately with all of the nation or firm characteristic variables. In particular, no correlation with the characteristic variables exceeds 20% in absolute magnitude, demonstrating that the information contained in our offshoring variables is unique. Importantly, External Input Dummy is positively correlated with FX Illiquidity and negatively correlated with FX RSQ. These findings indicate a main result we report later. This relation is more pronounced for Relative External vs Internal. We also find that our hedging cost and efficacy measures, FX Illiquidity and FX RSQ, are respectively negatively and positively correlated with factors generally associated with whether a nation is developed or not (GNP per capita, corruption, and rule of law measures).[25] Importantly, both FX hedging cost and efficacy have a high degree of variation within both developed and developing countries. Nevertheless, we include an additional control for developed nations in addition to all of the factors considered above. We also control for nation fixed effects to rule out unobserved national characteristics.

Several correlations between our key variables and other characteristics are of independent interest. The negative (positive) correlation between the external (internal) input and firm

[25] Our national governance measures for political stability, corruption control, rule of law, voice/accountability, government effectiveness, and regulatory quality are from the Worldwide Governance Indicators database from the World Bank. See López de Silanes, La Porta, Shleifer, and Vishny (1998) for a discussion of these variables. The correlation coefficients between these variables are as large as 70-85%. Therefore, we include only one of these variables in our regressions to avoid multicollinearity concerns.

size indicates that small firms are more likely to participate in external input and larger firms in internal input. Firm profitability is positively correlated with both types of input activities. Finally, external input is negatively correlated with GNP per capita, and internal input is negatively correlated with the distance between the U.S. and the foreign nation.

5. Operational hedging vs financial hedging

In this section, we examine the economic link between the illiquidity or the efficacy of FX hedging and the use of offshore external input. If the sale of offshore output generates exposure to stochastic foreign revenue, firms with offshore sales have incentives to hedge. If FX derivative instruments are less costly or more effective as hedges, then we would then expect that firms will be more likely to use FX hedging. In contrast, firms will substitute toward operational hedging if FX derivatives are costly or less effective.

5.1. FX illiquidity

We begin our analysis by considering firm-nation-year panel regressions in which the dependent variable is a text-based measure of offshore input. We are particularly interested in examining the predicted positive link between offshore external input and the given nation's FX illiquidity. We control for each nation's economic characteristics including GDP, GNP per capita, geographical proximity to the U.S., an indicator variable for developed nations, and political stability.[26] Nation and firm specific control variables are lagged, and all specifications include year fixed effects and standard errors are clustered by nation.

[Insert Table 5 Here]

The results are displayed in Table 5. Columns one, three, and five examine the effect of FX Illiquidity on a firm's external input, internal input, and the relative choice between external and internal input, respectively. We also include firm fixed effects and year fixed effects.

[26] Due to the high correlation, we only include one of the national governance measures among political stability, corruption control, rule of law, voice/accountability, government effectiveness, and regulatory quality. Results are robust to including any of these measures.

Columns two, four, and six display specifications that additionally include the interaction term between FX Illiquidity and the fraction of offshore output to the given nation. This test is relevant because although all firms in our sample engage in offshore output, some firms focus more on certain nations. Hence, the cross term examines whether external input is more strongly related to FX Illiquidity when the extensive margin of offshore output is larger in the given nation. This specification also allows us to additionally include nation fixed effects.

In the first column, we find that firms are more likely to participate in external input with a given nation when FX Illiquidity is higher. The economic impact of FX Illiquidity is that a one standard deviation shift in FX Illiquidity increases external input likelihood by 0.4 percentage points, which is a 5% rise from the average level of external input. This is comparable to the economic impact of firm profitability. The second column reinforces this conclusion as the cross term is also positive and significant. These results support Hypothesis 1, and suggest that firms use operational hedging when FX hedging is more costly. In particular, higher illiquidity would indicate higher trading costs and less market depth. In contrast, the result for internal input is insignificant in the third column. This is consistent with Hypothesis 2, where we predict that the link between FX hedging cost and external input will not necessarily apply to internal input. Column four shows that the interaction between FX Illiquidity and the fraction of offshore output to the given nation is also insignificant. Overall, we thus find insignificant results for internal input and strong results for external input, which supports our first two hypotheses and the conclusion that external input is more definitively linked to operational hedging motives.

In columns five and six, we further stress test Hypothesis 2 by directly contrasting external input and internal input. The dependent variable is the firm's relative choice between external and internal input in each nation, which is the ratio of the external input dummy to the sum of the external input and internal input dummies. This test examines the prediction that firms use more external input relative to internal input when FX Illiquidity is high. We find strong support as both columns show a significantly negative link between FX Illiquidity and relative external input, even in the most stringent test with nation fixed effects. Our results for FX Illiquidity are quite stark given that power is limited, as the measure is only available for a limited number of nations, and we include firm and nation fixed effects.

5.2. FX efficacy

In this section, we run tests parallel to those in the last section, but we now focus on FX efficacy instead of FX illiquidity. In Table 6, we thus consider the FX RSQ variable. This test is motivated by Chowdhry and Howe (1998), who illustrate that FX derivatives can have poor efficacy relative to operational hedges when demand uncertainty is high.

[**Insert Table 6 Here**]

In columns one and two, we find that firms are less likely to participate in external input when FX hedging efficacy is high.[27] In particular, the FX RSQ coefficient in the first column is negative and significant at the 1% level. The second column reinforces our finding as the cross term is also highly significant even with nation fixed effects. The results for internal input are insignificant in column three, but are significant in column four. These weaker results for internal input are predicted by Hypothesis 2. The hedging properties of internal input are ambiguous because the hedging power of input purchases are offset by the procyclical nature of asset ownership. Finally, the relative choice for external input in column five is negative and significant, which further supports Hypotheses 1 and 2 as firms favor external input over internal input when FX hedging is less effective. This result is especially strong in the more stringent test in column six with nation fixed effects.

Although we do not report them to conserve space, we consider three additional robustness tests. First, we run analogous tests using FX RSQ by replacing the aggregate consumption growth with the aggregate growth in corporate sales in the local economy.[28] Second, we consider a test in which we rerun our analysis on the subsample of European

[27]We include region fixed effects in addition to firm and year fixed effects in this test as our sample includes more than 150 nations compared to just 23 nations in the previous section.

[28]We obtain data on local firm corporate sales from Datastream Worldscope. Due to data availability in Datastream, we limit this sample to the top 50 offshoring nations.

nations. The impetus for this test is that European nations are more homogeneous on unobservables, which helps to further mitigate omitted variables concerns. Third, we rerun our analysis after excluding firms in commodity industries including Agriculture, Precious Metals, Mines, Coal, Oil and Utilities, as hedging motives could be different in these industries. In all three tests, we continue to see strong robust evidence consistent with our primary results.

Because we compute FX RSQ using deeply lagged data from each nation, it is unlikely that reverse causality can explain these results. However, although we include firm and nation fixed effects, it is difficult to rule out endogeneity in the form of omitted variables bias in this setting because the FX RSQ variable is indirect as a proxy for FX hedging efficacy.[29] This motivates the paper's main results based on DD tests in the next section.

6. Quasi-natural experiments

6.1. Launch of new FX derivative products

In this section, we consider quasi-natural experiments to explore a potential causal relation between hedging costs and the decision to use FX versus operational hedging. Our experiments are based on a series of CME launches of new FX derivative products. These events are staggered in time and well-suited for our panel structure based on firm-nation-year observations. In particular, only the specific nations treated with the launch of the new currency derivatives should be materially affected by the event. Even if firms primarily use OTC contracts, they should still be affected by the launch through spillovers regarding liquidity and price transparency, especially given the possibility of cross-market arbitrage. The shocks to FX hedging costs created by these new products allow us to test our central hypothesis that improved availability and liquidity of FX hedging instruments can cause firms to reduce operational hedging. We also consider the more refined prediction of Hypothesis 3 that the

[29]A more ideal test would be to model demand uncertainty at the industry level in each nation. However, we were not able to find adequate country-by-country industry-level consumption or corporate sales data.

predicted response to these shocks should be more pronounced when firms have a stronger incentive to hedge and when there are additional net benefits of operational hedging.

During our sample period, new products are launched in five distinct years: 1999, 2002, 2004, 2006 and 2009.[30] We carefully reviewed these new product launch events and isolated the events that are least contaminated by other major events in the same nations. Generally, the nations treated with new product launches have few notable events occurring during the year of treatment with the exception of 2004. We discuss each of the launch events in detail in Appendix C. In all cases, our inferences are not contaminated by worldwide events as we control for year fixed effects. Because these shocks occur during the middle of our sample, we are additionally able to include nation fixed effects and firm fixed effects in the various specifications. Our quasi-natural experiments benefit from being staggered in time series, and also in cross section across our panel of firm-nation observations. These features, along with the numerous fixed effects, help us to more firmly rule out omitted variables bias.

6.2. Difference-in-differences tests

We consider four sets of DD regressions based on the following four dependent variables in turn: External Input Dummy, Internal Input Dummy, Relative External vs Internal, and FX hedging. Our first test based on external input is a direct test of Hypothesis 1. We implement the DD model using a regression framework that includes a post-event dummy, a treated group dummy, and the post-event dummy interacted with the treated group dummy as key independent variables. We also include a standard set of controls as before. The variable of most interest is the post-event dummy interacted with the treatment dummy. We expect this interaction to be significant and negative.

[**Insert Table 7 Here**]

Table 7 presents the regression results for external input. All specifications include either firm and region or nation fixed effects in addition to year fixed effects. All post-event dummies are subsumed by year fixed effects. The treated group dummies in columns two, four, six,

[30] Table A.1 shows the complete list of product launch histories for the CME during our sample period.

eight and ten are subsumed by nation fixed effects. All nation and firm control variables previously used are included in the regressions, but are not reported to conserve space.[31]

In columns one and two, we consider a combined treatment event dummy based on the four distinct events by taking the respective union of the treated group dummies, the post-event dummies, and their interaction terms. The results in columns one and two strongly support the conclusion that the new CME product introductions resulted in a significant decrease in operational hedging in the form of external input activities. The economic impact of the estimated interaction variable coefficients (-0.678 to -0.827) implies that a new product launch decreases the likelihood of external input by 0.7 to 0.8 percentage points. Considering that the average level of external input is 7.63% in treated nations prior to the CME shocks, this is a 10% drop.

Throughout columns three to ten, we separately test this relation for each distinct event. In columns three to six, we confirm our aggregate finding that in treated nations, the likelihood of external input deceases significantly after a new product launch. The economic effect is largest for the two event years, 1999 and 2002, at 1.1 to 1.4 percentage points. This is a roughly 20% decrease compared to the pre-event external input activities. In columns seven to ten, we find insignificant results for the events in 2006 and 2009, as the interaction term is not significant. In 2006, this is likely due to low power as the only treated nations are Israel and South Korea. In 2009, this is likely because the newly introduced CME products, which are primarily E-Micro contracts, had less impact on the FX hedging costs as compared to the more dramatic launches in earlier years. The earlier launches include currency contracts that were not traded on the CME before or E-Mini contracts that more substantially reduced the minimum denomination.

[**Insert Table 8 Here**]

We next consider analogous tests for internal input as the dependent variable in Table 8. Unlike external input where the prediction of reduced operational hedging is clear, predictions are ambiguous for internal input as predicted by Hypothesis 2. This is because internal

[31] Results that report all control variables are available in Online Appendix Table OA.2.

input bundles the purchase of input (a hedge) with ownership of assets (a pro-cyclical exposure). These forces are in opposite directions, and which dominates is an empirical question. The results in Table 8 are somewhat mixed and therefore consistent with this theoretical ambiguity. We find negative and significant coefficients for the key interaction term in some specifications, but we also find a positive and significant effect in 2006.

[**Insert Table 9 Here**]

We further stress test Hypothesis 2 by directly contrasting external input and internal input in our next set of tests. In Table 9, the dependent variable is the relative external versus internal input, computed as the external input dummy divided by the sum of both the external and internal input dummies. In seven out of ten specifications, we find that the key interaction term is negative and significant. These results strongly support the conclusion that the launch of the new derivative products led to a decrease in external input relative to internal input operations. This is consistent with a reduced need for operational hedging after the liquidity-improving shocks.

Lastly, we conduct similar tests in which FX hedging activity is now the dependent variable. As discussed in Section 3, we consider three variations in how FX hedging is measured from 10-K text: (1) all types of derivative contracts, (2) futures and forward contracts only, and (3) futures contracts only. We focus on futures or forwards specifically because our shocks are to exchange-traded derivatives, which are mainly futures contracts. We consider forwards because these shocks should also spill over to the OTC market, which is highly active among corporate hedgers. We also remind readers that all FX hedging variables are only measurable at the firm-year panel level and not at the more refined firm-nation-year panel level. This limitation reduces power. In this reduced panel, we set the treated dummy to one if a firm was affected by a CME product launch event in a given year. A treated firm is one that had offshoring output operations in at least one of the treated nations for each event. All specifications include firm and year fixed effects.

[**Insert Table 10 Here**]

Table 10 presents the results. The first three columns report the DD results for FX hedging based on all derivatives, forwards and futures, and futures only, respectively. The next three columns are analogous, and use more refined textual searches that drop all hits that include discussions of FX interest rates. This is because some of these firms might be focused on using derivatives for purposes related to foreign debt, and not for revenue hedging (our primary interest). Regarding the count of FX hedge mentions, we find that all of the interaction terms between the treated firm dummy and the post-event dummy are positive and significant at the 1% or 5% level. The economic impact of the estimated interaction term coefficients for all derivatives (0.145 to 0.158) implies that new product launches increase textual mentions of FX derivatives by 15.6% to 17.1%, or approximately 0.2 more textual paragraphs. These results strongly support the conclusion that the new CME product introductions led firms to increase their use of FX derivative instruments as predicted. In columns two and three, and five and six, we find that firm mentions of futures and forwards specifically increase in a significant way. This further supports the validity of our quasi-natural experiments, and suggests that the new exchange-traded products affected treated nations directly (increased use of futures contracts specifically), and also indirectly through the OTC market (futures and forward contracts). In all, our results suggest that the new CME products improved liquidity and led firms to increase their FX derivative use, and in turn reduce their use of operational hedging.

6.3. Timing of treatment effects

As our DD tests have a time series component, we also consider a placebo test based on Tables 7, 8, and 9 to examine whether firms in treated and untreated nations behave divergently in placebo years prior to the new CME product launches. We specifically consider event windows beginning two or three years before the actual event years (conservatively allowing for the possibility that the predicted treatment effect appears gradually in the data). The results are presented in Online Appendix Table OA.3. We find that none of the key interactions between the post-event dummy and the treatment dummy are significant, supporting the conclusion that our results cannot be explained by non-parallel trends.

We next examine timing more directly. Fig. 2 displays the rate of discontinuation of external input among firms that participated in external input in the prior year, and the rate of initiation for firms that ex-ante did not participate in such activity in the prior year. We examine discontinuation and initiation in both treated and untreated nations over five-year event windows centered around the event years. We choose five-year windows because this allows us to display results averaged over all four event years (1999, 2002, 2006 and 2009) given that our sample spans from 1997 to 2011. We predict that discontinuation of external input should rise sharply after (but not before) the launch of the new derivative products. In particular, our operational hedging hypothesis predicts that prior to the shocks, many firms were likely participating in operational hedging due to the lack of viable derivatives. When the shock arrives, many of these firms would then discontinue operational hedging in favor of the new FX derivatives. Our hypothesis is silent regarding the rate of initiation of external input because firms were not ex-ante constrained from doing this activity.

[Insert Fig. 2 Here]

In the upper figure (a), we observe that the rate of external input discontinuation indeed increases sharply after the new product launches, but only in treated nations. We also clearly observe the parallel trends between the treated and untreated groups in the years prior to the events and the parallel trends then neatly diverge after the shocks arrive. The observed change for treated nations is also economically large, as discontinuation increases from 13.5% to nearly 16%. In the lower figure (b), in contrast, we observe far more modest changes in the rate of initiation of external input. The initiation rate initially dips slightly after treatment, and then increases. These results suggest that the treatment mainly impacted the rate of discontinuation as our operational hedging hypothesis would predict. These findings, along with the absence of non-parallel trends, suggest strongly that our DD tests are valid.

6.4. Triple differences

In the previous DD tests, we treat all firms equally regarding their reactions to the new product launch shocks. In this section, we consider triple DD specifications and examine whether the shift away from operational hedging toward FX hedging following the shocks is larger for firms with elevated hedging incentives or net benefits as in Hypothesis 3.

[Insert Table 11 Here]

In Table 11, we reconsider the models in columns one and two of Table 7 with one key change: the introduction of one of the following firm or nation characteristics and the corresponding triple interaction variables: (1) whether the firm already has existing internal input operations in the given nation, (2) whether the given nation is geographically close, (3) whether the firm's production function is highly input dependent, (4) whether FX derivatives for the given nation are likely effective hedges against demand uncertainty, (5) whether the firm is in a highly competitive product market, and (6) whether the firm is financially constrained. All six identify firm or nation characteristics predicted to be related to the incentives to hedge or net benefits of hedging as discussed in Section 2. For each specification, we report both a model with firm, region and year fixed effects, and a model with nation and year fixed effects. In all cases, the dependent variable is the offshore external input dummy.

In the first row, we consider whether the firm owns producing assets in the given nation. If so, the firm likely has a less reversible longer-term commitment. Operational hedging should become more marginally relevant compared to FX hedging for longer term projects (Kim, Mathur, and Nam, 2006). We thus predict that the negative link between CME product launches and external input should be stronger for these firms. Our results confirm this prediction as the triple interaction term in this first row is negative and significant. These findings support the conclusion that operational hedging is more salient for longer term projects that are less reversible. In the second row, we examine the role of geographic proximity, based on the assumption that it is less costly to adopt operational hedging in more proximate nations, as the purchased inputs can be delivered and processed with lower cost. The findings in row two for the triple interaction are negative and significant supporting the prediction. Row three illustrates that our results are also stronger when another auxiliary benefit of external input is larger: when the firm has a high relative cost ratio, COGS/sales. When this ratio is high, a larger fraction of sales can be optimally hedged by purchasing inputs in the same nation, and we find that our results for operational hedging are indeed stronger. Row four illustrates that FX derivative efficacy also plays its predicted role. FX RSQ, as previously explained, captures the extent to which a given nation's exchange rate comoves with the national consumption growth of the nation. High FX RSQ thus implies that firms can more effectively hedge demand uncertainty using FX derivatives. We find that firms indeed do more FX hedging when the newly launched FX derivatives are likely to be more effective against demand uncertainty.

Rows five and six relate to competition, and financial constraints as measured by the delay of investment in Hoberg and Maksimovic (2015). As discussed in Section 2, both competition and financial constraints likely increase the firm's incentives to participate in precautionary policies such as hedging. We thus predict that the DD results will be stronger when competition is more intense or when firms are more constrained (Froot, Scharfstein, and Stein, 1993). In rows five and six, the key results are indeed stronger in both cases.[32] In summary, we find strong evidence that a rich set of auxiliary costs and benefits impact the decision to use FX hedging versus operational hedging, consistent with Hypotheses 3.

6.5. Hedging outcomes

We now assess the economic importance of the CME shocks by examining broader outcomes. The primary impact of the CME shocks is to broaden the hedging tool kit of treated firms. Because hedging is valuable (see Section 2), our first broader prediction is that treated firms should have higher stock returns in the year of treatment. Our second prediction is that treated firms should become less risky, both in terms of operating profit and stock returns. Both predictions should be stronger when firms have stronger incentives to hedge.

[32] One exception to this prediction relates to collateral constraints (Rampini and Viswanathan, 2010). In Online Appendix Table OA.4, we find some support for the prediction that constraints in the debt market are different. However, in all other tests, our results are consistent with the classic precautionary view.

[Insert Table 12 Here]

We test these predictions in Table 12. Columns one and five examine the baseline DD specification and the remaining columns examine triple DD specifications for the following three variables: COGS/sales, competition, and financial constraints.[33] The dependent variables are annual stock returns, stock return volatility, cash flow volatility, and foreign exchange rate beta in Panels A, B, C and D, respectively. Our first four rows use the conservative firm-year panel database and the last four rows use the richer firm-nation-year database (in these latter tests we conservatively cluster standard errors within firm and year).

Panel A displays the results for stock returns. Column one shows that stock returns are higher for treated firms in the DD tests using the firm-year panel. Column five shows that this result is positive but not significant when we consider the firm-nation-year panel. Results for the triple DD tests are even stronger, as we find that the triple DD terms are also positive and significant when competition is high and when firms are financially constrained (significant in both panel databases). We conclude that the CME shocks had material positive value impact on treated firms, especially when incentives to hedge are stronger.

Panels B, C, and D display similar tests for our three risk variables: stock return volatility, operating profit volatility, and foreign exchange rate beta, respectively. Overall, the DD tests in columns one and five produce negative and significant treatment effects for four of six coefficients, supporting our prediction of risk mitigation. Regarding the triple DD tests, we find many negative and significant coefficients as well, especially for operating profit volatility in Panel C and exchange rate betas in Panel D. We conclude that the CME shocks were important and produced real risk reduction benefits for treated firms.

[33] We limit our tests to these three variables because (like most of our dependent variables) these are firm-year characteristics and not firm-nation-year characteristics.

7. Conclusion

We propose a novel operational hedging mechanism in which firms hedge FX cashflow exposures by purchasing inputs from the same nations in which they sell output. This hedge is particularly strong when firms do not bundle input purchases with ownership of producing assets, which can be pro-cyclical. We examine this mechanism using a dynamic firm-nation-year network that characterizes each firm's offshore activities with all nations in three categories: sale of output, purchase of input, and the ownership of assets. We create this network, as well as FX hedging measures, using textual analysis of firm 10-Ks. In all, our paper makes economic, methodological, and empirical contributions to the hedging literature.

We consider measures of currency liquidity and the efficacy of FX hedging when demand uncertainty is high. Our initial findings are that firms are more likely to use FX hedging when FX derivatives are more liquid and their efficacy is higher. Firms in contrast increase operational hedging activities when the liquidity or efficacy of FX hedging is poor.

Our main results are based on quasi-natural experiments associated with new derivative product launches by the CME. These shocks affect many nations in different years, allowing us to construct a staggered difference-in-differences framework that controls for overall economic trends and both observed and unobserved firm and nation effects. These tests focus on changes in operational versus financial hedging for treated nations specifically around the staggered treatment dates. We find results strongly supporting the conclusion that positive shocks to FX derivative liquidity likely cause firms to substitute away from operational hedging and toward FX hedging. We also find that these effects are stronger when the incentives to hedge are greater or the costs of hedging are lower, affirming that firms likely consider an array of costs and benefits when making hedging decisions. Finally, we confirm that the substitution toward FX hedging following the shocks is associated with higher stock returns and reduced risk. Our results overall suggest that firms consider a portfolio approach to hedging that incorporates both operational and financial hedging components.

Appendix A. Offshore words

Offshoring output words: SALES, MARKETS, CUSTOMERS, DISTRIBUTION, MARKETING, REVENUES, DISTRIBUTORS, REVENUE, EXPORT, CUSTOMER, DISTRIBUTOR, DEMAND, STORES, CONSUMER, MARKETED, DISTRIBUTE, DISTRIBUTES, DISTRIBUTED, SHIPMENTS, DEALERS, CLIENTS, WHOLESALE, EXPORTS, STORE, MARKETPLACE, CONSUMERS, DEALER, EXPORTED, CLIENT, DISTRIBUTING, DISTRIBUTIONS, DEMANDS, DISTRIBUTORSHIP, EXPORTING, WHOLESALERS, RECEIVABLE, RECEIVABLES.

Offshoring external input words: SUPPLIERS, IMPORT, SUPPLIER, IMPORTS, IMPORTED, IMPORTATION, VENDORS, SUBCONTRACTORS, SUBCONTRACTOR, VENDOR, IMPORTING, SUBCONTRACT, PURCHASE & FROM, PURCHASED & FROM, PURCHASES & FROM.

Offshoring internal input words: SUBSIDIARIES, SUBSIDIARY, FACILITIES, FACILITY, VENTURE, PLANT, EXPLORATION, PLANTS, VENTURES, WAREHOUSE, STORAGE, FACTORY, SUBSIDIARIES, WAREHOUSES, WAREHOUSING, FACTORIES.

Offshoring indeterminate input words: MANUFACTURING, PRODUCTION, MANUFACTURED, MANUFACTURE, MANUFACTURES, PRODUCED, PRODUCING, PRODUCE, PRODUCES, PRODUCTIONS.

Appendix B. Variable descriptions

External Input Dummy	is one if the firm discusses its offshore external input with the relevant vocabulary in our offshore word lists along with a given nation word in a given year.
Internal Input Dummy	is one if the firm discusses its offshore internal input with the relevant vocabulary in our offshore word lists along with a given nation word in a given year.
Relative External vs Internal	is computed as External Input Dummy divided by the sum of both External Input Dummy and Internal Input Dummy.
FX Hedging Dummy	is one if the firm discusses foreign currency derivative instruments in its annual 10-K.
FX Hedging Dummy (including debt)	is one if a firm either discloses its use of any types of currency derivative products in its 10-K in a given year or raised any foreign currency debt during five years prior to the given year.
Log(1+#FX Hedge)	is the log of one plus the firm's number of total textual mentions of foreign currency derivative instruments in its 10-K in a given year.
FX Illiquidity	is the annual illiquidity estimate for a given nation's currency against US dollars. We use the annual average of the monthly FX illiquidity estimates provided by Karnaukh, Ranaldo, and Söderlind (2015).
FX Futures Volume	is the log of one plus the size (notional principal) of all exchange-traded futures contracts in billions of US dollars for a given nation in a given year. The exchange-traded futures contract volume data come from the exchange-traded derivatives statistics at the Bank for International Settlements (BIS) website at http://www.bis.org/statistics/extderiv.htm.
FX RSQ	is a given nation's R-squared estimate from the regressions of consumption growth in US dollars on the exchange rate changes using available consumption and exchange rates data from the World Bank from 1970 until 1990.
Log(GDP)	is a given nation's Gross Domestic Product in 1996 available from the World Bank.
Log(GNPpc)	is a given nation's Gross National Product per capital in 1996 available from the World Bank.
Distance from US	is a given nation's distance from US, computed using the latitude and longitude information of the nation's capital city.
Political Stability	is a measure of perceptions of the likelihood that the government will be destabilized by unconstitutional or violent means, including politically-motivated violence and terrorism. The Worldwide Governance Indicators including Political Stability, Corruption Control, Rule of Law, Voice/Accountability, Government Effectiveness, and Regulatory Quality are available from the Word Bank website at http://info.worldbank.org/governance/wgi/index.aspx#home.
Corruption Control	is a measure of perceptions of the extent to which public power is exercised for private gain.
Rule of Law	is a measure of perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
Voice/Accountability	is a measure of perceptions of the extent to which a nation's citizens can participate in selecting government and freedom of expression, association, and free media.
Government Effectiveness	is a measure of perceptions of the quality of public and civil services, the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment.
Regulatory Quality	is a measure of perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
Developed	is an indicator variable for the developed nation status. We obtain the developed nation status as of 1996 from the World Bank.
Log(MV Assets)	is the log of market value of total assets (market value of common equity plus book value of preferred stock, long-term and short-term debt, and minority interest).
Log(1+Age)	is the log of one plus firm age based on first appearance in Compustat.
Tobin Q	is market value of assets divided by book value of assets.
Operating Margin	is operating income before depreciation, scaled by sales.
Book Leverage	is the ratio of total debt to the book value of assets.
Dividend Payer	is one if the firm paid dividends at the given year.
Cash/Assets	is cash and short-term investments divided by total assets.
PPE/Assets	is gross property, plant and equipment divided by total assets in the prior year.

CAPX/Sales	is capital expenditures divided by sales.
R&D/Sales	is R&D expenditures divided by sales.
Output Fraction	is the firm's output focus on a given nation, which is computed as the number of times the firm mentions its offshore output to the given nation divided the total number of times the firm mentions its offshore output to any nation in our sample.
Close Distance	is a dummy variable that equals one if a given nation's distance from US is less than the median of all nations in our sample.
COGS/sales	is an input dependence measure computed with cost of goods sold divided by sales.
High FX RSQ	is a nation dummy variable that equals one if the nation's estimated FX RSQ is greater than the median of all nations in our sample.
Competition	is the Text-based Network Industry Classifications (TNIC) measure of firm competition by Hoberg and Phillips (2015).
Financially Constrained	is a financial constraints measure from Hoberg and Maksimovic (2015) with higher values indicating that firms are more at risk of delaying their investments due to issues with liquidity.
Cash Flow Volatility	is the standard deviation of operating income before depreciation scaled by sales from the 12 previous quarters.
Stock Return Volatility	is the standard deviation of the firm's daily logarithmic returns over the 252 trading days starting from June to May in the next year, multiplied by the square root of the time period, 252.
Foreign Stock (Exchange Rate) Beta	is measured based on regressing the firm's stock return on the given nation's stock market index (logarithmic exchange rate) returns. Each beta regression is run once per year based on twelve monthly observations and then the beta estimates are shrunk based on Vasicek (1973).

Appendix C. Detailed description of the CME events

In 1999, CME started trading EURO FX, E-mini EURO FX, and E-mini Japanese Yen.[34] This year was unusual relative to other event years because in January 1999, the Euro became a new currency and unified monetary policy was introduced. The 11 treated nations include Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain. We also importantly note that the 11 treated nations did not join the European Union (EU) in this same year.[35] Although the creation of the EU occurred in a different year, the EMU did launch a unified monetary policy in 1999, which might be a cause for concern. For example, a unified monetary policy might result in changes in the risk profile of these nations. For this reason, we will interpret results for 1999 with some caution. However, we include all of the treated nations including the Euro nations in our 1999 test because the introduction of the new currency (the Euro) is a particularly stark example of a shock to the efficacy of hedging. More succinctly, one can view the simultaneous launch of the new currency, alongside the launch of the CME derivative products, to be a single event that provides US firms with a strong positive shock to hedging efficacy.

Japan is also in the treated group in 1999 as its E-mini contacts started trading in the same year. The E-mini contract can be traded for a fraction of the value of a normal futures contracts traded on the CME's Globex electronic trading platform. E-mini contracts provide trading advantages, including higher liquidity, tighter spreads, greater affordability for individual investors due to lower margin requirements, and several tax advantages. Important from our perspective is the improved liquidity that they should bring to the Japanese Yen market as a whole. We consider a robustness test in which we exclude the European nations in 1999 from our sample (due to potential concerns about the aforementioned monetary policy), which would leave only Japan as a treated nation in 1999. We note that even in this stark setting based only on Japan, we continue to see statistically significant evidence consistent with our primary hypothesis that the shock was followed by a reduction in operational hedging activities, especially external offshore input activities in the treated nation.

In 2002, the CME started trading contracts on Norwegian Krona and Swedish Krona,

[34] The E-mini contract represents a fraction of the value of a normal futures contract traded on the CME's Globex electronic trading platform. E-micro is also available at the CME which is a futures contract representing an even smaller fraction of the value of the normal futures contracts than the corresponding E-mini. For example, the contract size of Euro FX E-mini and E-micro is 62,500 and 12,500 respectively, while the contract size of a normal futures contract is 125,000.

[35] These nations joined the European Union (EU) far before they joined the European Monetary Union (EMU). The year that each of the 11 treated nations joined the EU is as follows: Austria (1995), Belgium (1958), Finland (1995), France (1958), Germany (1958), Ireland (1973), Italy (1958), Luxembourg (1958), Netherlands (1958), Portugal (1986), Spain (1986). We note that these dates all precede our sample period, and hence our identification of hedging efficacy through the introduction of the Euro is not contaminated by other economic information associated with the distinct event of joining of the EU.

and these two nations are the treated group for the 2002 event. To our knowledge, this event is particularly free of contamination from other events as we are not aware of other major events for these two nations at this time. Hence results for our DD test surrounding the 2002 event should be particularly indicative of a causal link between hedging efficacy and operational hedging through offshore external input.

In 2004, the CME started trading contracts on Czech Koruna, Hungarian Forint and Polish Zloty. However, this event is problematic because all three countries joined the EU in the same year. Because the economic impact of accession to the EU is likely greater than the effect of newly launched CME products, we drop this year from our analysis and do not consider it further. This decision is further reinforced by the fact that these three nations were previously relatively inactive regarding foreign trade.

In 2006, the CME started trading contracts on the Chinese Renminbi, Israel Shekel and Korean Won. The affected nations for 2006 are thus China, Israel, and South Korea. For our regression analyses, however, we drop China from our sample because China is one of the nations that have fixed peg to US dollars during our sample period.

Lastly, in 2009, the CME began trading E-Micro contracts on the EURO, GBP, AUD, JPY, CAD, CHF, and Turkish Lira. Because futures contracts for these currencies were already trading prior to this date, at first, the introduction of E-Micro contracts (which allow for smaller denominations) might seem less important in our context. However, we note that this event affects a large number of observations in our sample due to the high levels of trade with nations that use these currencies. Hence, small improvements in liquidity for this many firms could also be informative. We consider the relevance of E-Micro to thus be an empirical question. In all, the 16 EMU member nations are affected by this event as they use the Euro. These nations include the previous 11 initial EMU members (Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain) and five more nations (Greece, Slovenia, Cyprus, Malta, and Slovak Republic). Also, the United Kingdom, Australia, Japan, Canada, Switzerland, and Turkey are also included in the treated group for 2009.

Table A.1
New currency product launching events by the CME

The table displays the list of the CME's new currency product launch events within our sample period from 1997 to 2011 that are useful for our quasi-natural experiments. The list is from the CME website. The E-mini contract represents a fraction of the value of a normal futures contract traded on the CME's Globex electronic trading platform. E-micro is a futures contract that represents an even smaller fraction of the value of the normal futures contracts than the corresponding E-mini.

Product	Futures	Options	Affected nations
Euro FX	1/4/1999	1/4/1999	Austria, Belgium, Finland, France, Germany, Italy, Luxembourg, Netherlands, Portugal, Spain
E-mini Euro FX	10/7/1999	n/a	Austria, Belgium, Finland, France, Germany, Italy, Luxembourg, Netherlands, Portugal, Spain
E-mini Japanese Yen	10/7/1999	n/a	Japan
Norwegian Krone	5/16/2002	n/a	Norway
Swedish Krona	5/16/2002	n/a	Sweden
Chinese Renminbi	8/28/2006	8/28/2006	China
Israeli Shekel	5/8/2006	5/8/2006	Israel
Korean Won	9/18/2006	9/18/2006	South Korea
E-Micro GBP/USD	3/23/2009	n/a	United Kingdom
E-Micro EUR/USD	3/23/2009	n/a	Austria, Belgium, Cyprus, Finland, France, Germany, Italy, Luxembourg, Malta, Netherlands, Portugal, Slovak Republic, Slovenia, Spain
E-Micro AUD/USD	3/23/2009	n/a	Australia
E-Micro USD/JPY	3/23/2009	n/a	Japan
E-Micro USD/CAD	3/23/2009	n/a	Canada
E-Micro USD/CHF	3/23/2009	n/a	Switzerland
Turkish Lira	1/26/2009	n/a	Turkey

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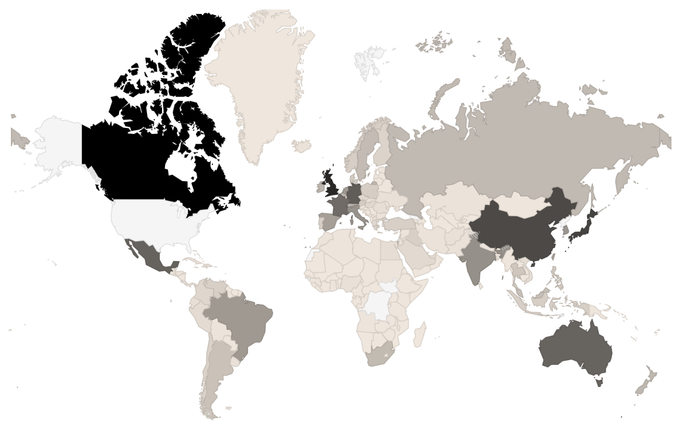
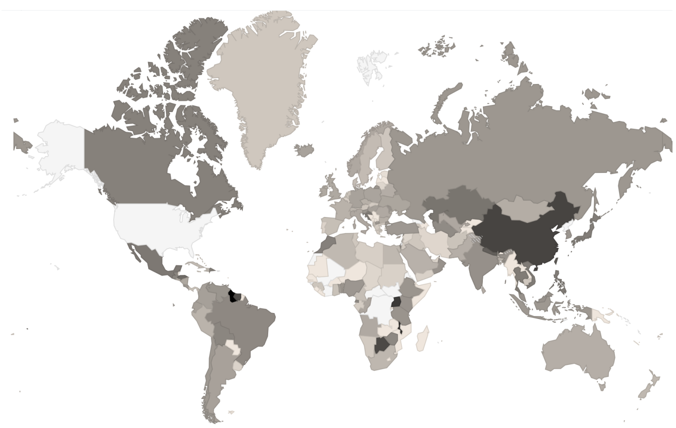
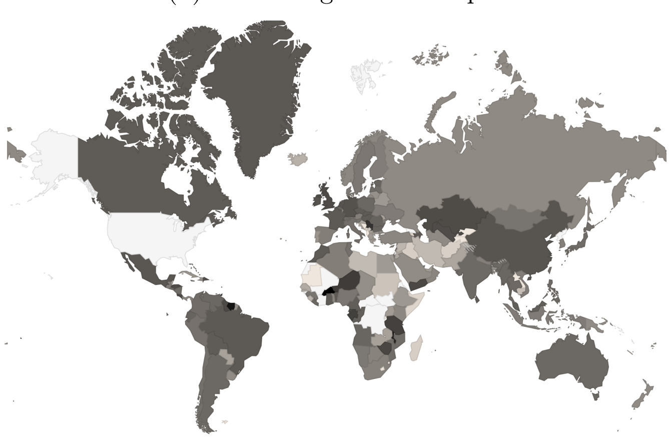
Fig. 1 Offshoring output, external input, and internal input by nation. The figures display nations in which the U.S. firms in our sample offshore their output and input during the sample period from 1997 to 2011. (a), (b), and (c) display the average intensity over our sample period that a firm offshores its output, external input, and internal input in each nation, respectively. Darker shades indicate greater intensity for each measure.



(a) Offshoring output

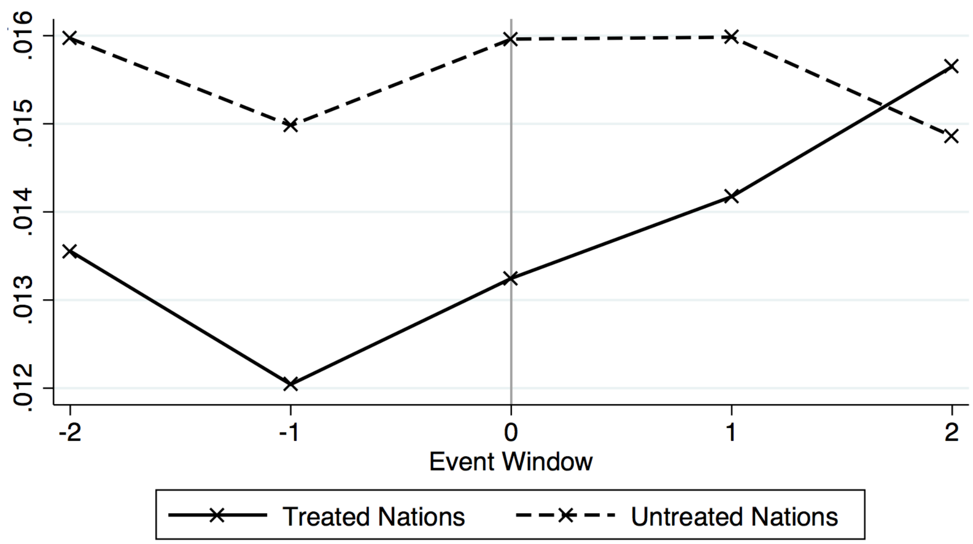


(b) Offshoring external input

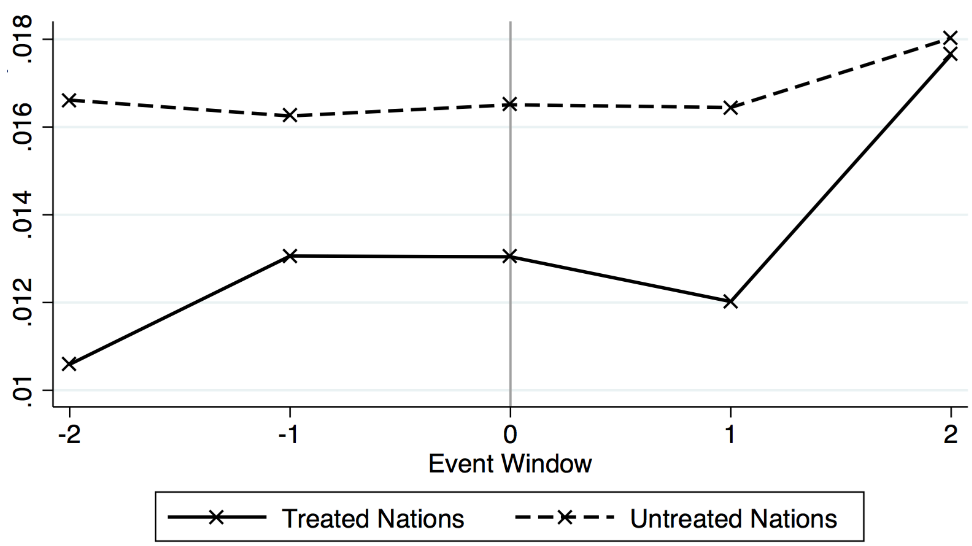


(c) Offshoring internal input

Fig. 2 Discontinuation and initiation of offshore external input surrounding the new CME product launches. The figures display the rates of (a) discontinuation and (b) initiation of offshore external input operations in treated vs control nations among firms in our sample around the new CME product launch events. The rate of discontinuation of external input is computed as the number of annual firm-nation observations in which the previous year's external input operation is discontinued in a given year dividend by the number of annual firm-nation observations that had external input operations in the previous year. The rate of initiation of external input is computed as the number of annual firm-nation observations in which external input operations are newly started in a given year dividend by the number of annual firm-nation observations that had no external input operation in the previous year. The rates are the averages over the CME's launching events of new FX derivative products in four distinct years, 1999, 2002, 2006 and 2009, with all observations centered around the launch year. Based on our sample period of 1997-2011, we report the full two-year event window, [-2,+2].



(a) Discontinuation of external input



(b) Initiation of external input

Table 1
Validation using Census trade data

The table displays lists of the top 50 nations in which U.S. firms offshore their output (Panel A) and input (Panel B) over the three different five-year periods of 1997-2001, 2002-2006, and 2007-2011. For each sample period, we compare our list to rankings based on the U.S. Census Bureau's historical trade data. The Census historical trade data are available at https://www.census.gov/foreign-trade/statistics/historical/index.html. Exports is the annually estimated total export amount by all U.S. firms including both private and public firms in million dollars. Imports is the annually estimated total import amount by all U.S. firms including both private and public firms in million dollars. Mentions is the total number of output or input mentions that appear near each nation word by all public firms in our sample in the given period. For each five-year sample, we report the annual averages of Exports, Imports, and Mentions over the five-year period.

Panel A: Exports vs offshore output

	Census trade data (1997-2001)		Our data (1997-2001)		Census trade data (2002-2006)		Our data (2002-2006)		Census trade data (2007-2011)		Our data (2007-2011)	
Rank	Nation	Exports	Nation	Mentions	Nation	Exports	Nation	Mentions	Nation	Exports	Nation	Mentions
1	Canada	163467.0	Canada	10265.4	Canada	196040.6	Canada	10389.2	Canada	196040.6	Canada	10389.2
2	Mexico	89943.1	Japan	6221.2	Mexico	113499.5	Japan	5634.3	Mexico	113499.5	Japan	5634.3
3	Japan	60644.3	United Kingdom	5849.2	Japan	57949.3	China	5619.4	Japan	57949.3	China	5619.4
4	United Kingdom	39235.1	Australia	3461.2	United Kingdom	41484.5	United Kingdom	5091.5	United Kingdom	41484.5	United Kingdom	5091.5
5	Germany	27471.9	Mexico	3430.6	China	39246.3	Mexico	3380.1	China	39246.3	Mexico	3380.1
6	South Korea	22900.1	Germany	3424.6	Germany	35354.7	Australia	3251.8	Germany	35354.7	Australia	3251.8
7	Taiwan	20037.8	France	2729.0	South Korea	27402.1	Germany	3082.3	South Korea	27402.1	Germany	3082.3
8	Netherlands	19912.4	South Korea	2564.6	Netherlands	25690.9	South Korea	2674.8	Netherlands	25690.9	South Korea	2674.8
9	France	18559.4	Singapore	2556.4	France	21752.4	France	2415.9	France	21752.4	France	2415.9
10	Singapore	17019.1	China	2524.4	Taiwan	21229.9	Singapore	2351.3	Taiwan	21229.9	Singapore	2351.3
11	China	15116.4	Hong Kong	2264.8	Singapore	20448.2	Hong Kong	2058.9	Singapore	20448.2	Hong Kong	2058.9
12	Brazil	15091.8	New Zealand	1640.8	Brazil	18941.1	Brazil	1596.4	Brazil	18941.1	Brazil	1596.4
13	Hong Kong	13860.8	Brazil	1614.4	Belgium	18131.4	India	1418.8	Belgium	18131.4	India	1418.8
14	Belgium	13429.5	Italy	1421.2	Hong Kong	16740.0	New Zealand	1416.0	Hong Kong	16740.0	New Zealand	1416.0
15	Australia	11842.3	Netherlands	1241.0	Australia	15376.9	Italy	1374.0	Australia	15376.9	Italy	1374.0
16	Malaysia	9818.4	Taiwan	1176.8	Switzerland	12269.2	Taiwan	1205.7	Switzerland	12269.2	Taiwan	1205.7
17	Italy	9810.5	Spain	1031.8	Italy	11465.9	Netherlands	1073.1	Italy	11465.9	Netherlands	1073.1
18	Switzerland	8737.4	India	869.4	Malaysia	10944.1	Spain	1040.4	Malaysia	10944.1	Spain	1040.4
19	Saudi Arabia	7812.3	Switzerland	843.8	India	8529.1	Russia	775.8	India	8529.1	Russia	775.8
20	Philippines	7567.0	Israel	813.4	Israel	8527.2	Switzerland	752.8	Israel	8527.2	Switzerland	752.8
21	Israel	7178.0	Russia	706.2	Saudi Arabia	8094.2	Israel	723.5	Saudi Arabia	8094.2	Israel	723.5
22	Ireland	6305.9	South Africa	690.2	Philippines	7417.7	Ireland	677.4	Philippines	7417.7	Ireland	677.4
23	Thailand	6035.9	Belgium	689.4	Spain	7303.0	Argentina	663.3	Spain	7303.0	Argentina	663.3
24	Venezuela	5932.6	Argentina	678.2	Venezuela	7134.6	Belgium	643.9	Venezuela	7134.6	Belgium	643.9
25	Spain	5840.7	Ireland	650.2	Ireland	7122.8	South Africa	616.7	Ireland	7122.8	South Africa	616.7
26	Argentina	5052.2	Sweden	581.8	Thailand	6836.7	Sweden	517.1	Thailand	6836.7	Sweden	517.1
27	Dominican Rep.	4167.7	Malaysia	535.6	UAE	6518.5	Malaysia	514.1	UAE	6518.5	Malaysia	514.1
28	Colombia	4165.5	Thailand	401.8	Colombia	6168.2	Philippines	419.2	Colombia	6168.2	Philippines	419.2
29	Sweden	3896.3	Philippines	376.0	Chile	5636.6	Poland	370.5	Chile	5636.6	Poland	370.5
30	India	3656.8	Poland	367.6	Turkey	5005.2	Thailand	356.3	Turkey	5005.2	Thailand	356.3
31	Chile	3601.0	Austria	353.6	Dominican Rep.	4874.9	Venezuela	342.1	Dominican Rep.	4874.9	Venezuela	342.1
32	Turkey	3415.4	Venezuela	336.2	Argentina	4851.6	Czech Republic	338.9	Argentina	4851.6	Czech Republic	338.9
33	Egypt	3358.7	Czech Republic	325.4	Russia	4157.0	Austria	329.7	Russia	4157.0	Austria	329.7
34	South Africa	3051.9	Indonesia	317.2	Egypt	3991.6	Saudi Arabia	315.2	Egypt	3991.6	Saudi Arabia	315.2
35	Russia	2757.2	Saudi Arabia	302.2	Sweden	3981.1	Turkey	303.3	Sweden	3981.1	Turkey	303.3
36	Indonesia	2756.4	Chile	299.2	South Africa	3874.9	Denmark	301.9	South Africa	3874.9	Denmark	301.9
37	UAE	2520.7	Denmark	291.6	Costa Rica	3526.4	Chile	291.6	Costa Rica	3526.4	Chile	291.6
38	Austria	2400.4	Norway	274.2	Indonesia	3523.3	Indonesia	278.9	Indonesia	3523.3	Indonesia	278.9
39	Honduras	2341.2	Colombia	257.4	Honduras	3171.7	Norway	266.4	Honduras	3171.7	Norway	266.4
40	Costa Rica	2332.8	Turkey	230.0	Peru	2964.7	Portugal	227.4	Peru	2964.7	Portugal	227.4
41	New Zealand	1970.6	Portugal	224.6	Guatemala	2827.9	Colombia	217.2	Guatemala	2827.9	Colombia	217.2
42	Guatemala	1849.9	Finland	215.8	Panama	2624.3	Hungary	210.6	Panama	2624.3	Hungary	210.6
43	Peru	1787.3	Hungary	186.0	Austria	2455.3	Finland	206.1	Austria	2455.3	Finland	206.1
44	Denmark	1694.6	Dominica	176.2	Ecuador	2265.3	Dominica	187.1	Ecuador	2265.3	Dominica	187.1
45	Finland	1689.9	Peru	162.6	New Zealand	2229.7	Iraq	182.4	New Zealand	2229.7	Iraq	182.4
46	Norway	1650.3	Greece	149.8	Finland	2100.3	Greece	175.2	Finland	2100.3	Greece	175.2
47	Panama	1594.9	Luxembourg	142.4	Norway	2091.9	Peru	155.5	Norway	2091.9	Peru	155.5
48	El Salvador	1594.4	Costa Rica	133.6	Denmark	1974.2	Luxembourg	144.0	Denmark	1974.2	Luxembourg	144.0
49	Jamaica	1359.0	Ecuador	92.8	El Salvador	1897.1	Costa Rica	113.6	El Salvador	1897.1	Costa Rica	113.6
50	Ecuador	1313.8	Dominican Rep.	85.2	Nigeria	1860.3	Ukraine	106.3	Nigeria	1860.3	Ukraine	106.3

Panel B: Imports vs offshore input

Rank	Census trade data (1997-2001)		Our data (1997-2001)		Census trade data (2002-2006)		Our data (2002-2006)		Census trade data (2007-2011)		Our data (2007-2011)	
	Nation	Imports	Nation	Mentions	Nation	Imports	Nation	Mentions	Nation	Imports	Nation	Mentions
1	Canada	197261.5	Canada	6898.0	Canada	244757.5	China	7390.4	Canada	244757.5	China	7390.4
2	Japan	129464.9	United Kingdom	5508.2	China	195993.5	Canada	7170.8	China	195993.5	Canada	7170.8
3	Mexico	111510.3	Mexico	4480.6	Mexico	156270.4	United Kingdom	4918.5	Mexico	156270.4	United Kingdom	4918.5
4	China	83562.2	China	4014.2	Japan	128847.2	Mexico	4439.9	Japan	128847.2	Mexico	4439.9
5	Germany	53156.2	Germany	3217.6	Germany	70936.2	Germany	3136.9	Germany	70936.2	Germany	3136.9
6	United Kingdom	38289.7	Japan	3055.2	United Kingdom	45609.9	Japan	2818.5	United Kingdom	45609.9	Japan	2818.5
7	Taiwan	34966.9	France	2471.2	South Korea	39004.2	Singapore	2515.3	South Korea	39004.2	Singapore	2515.3
8	South Korea	30756.5	Singapore	2447.2	Taiwan	34646.9	France	2372.6	Taiwan	34646.9	France	2372.6
9	France	26113.8	Australia	2307.2	France	32050.7	Australia	2215.3	France	32050.7	Australia	2215.3
10	Italy	22311.1	Hong Kong	2058.8	Italy	27075.6	Hong Kong	1989.9	Italy	27075.6	Hong Kong	1989.9
11	Malaysia	21272.0	South Korea	1723.2	Malaysia	26196.7	South Korea	1870.8	Malaysia	26196.7	South Korea	1870.8
12	Singapore	18160.0	Brazil	1625.0	Venezuela	24873.5	Brazil	1740.4	Venezuela	24873.5	Brazil	1740.4
13	Thailand	14296.0	Italy	1356.6	Ireland	22632.6	India	1381.4	Ireland	22632.6	India	1381.4
14	Venezuela	13573.3	Taiwan	1317.4	Saudi Arabia	21885.4	Taiwan	1370.3	Saudi Arabia	21885.4	Taiwan	1370.3
15	Ireland	12045.0	Netherlands	1252.4	Brazil	18938.4	Italy	1324.1	Brazil	18938.4	Italy	1324.1
16	Philippines	12001.0	Ireland	1187.0	Thailand	17818.3	Netherlands	1241.8	Thailand	17818.3	Netherlands	1241.8
17	Brazil	11872.0	India	1089.6	Nigeria	17100.9	Ireland	1113.8	Nigeria	17100.9	Ireland	1113.8
18	Hong Kong	10489.8	Malaysia	903.0	Singapore	16885.7	Malaysia	950.2	Singapore	16885.7	Malaysia	950.2
19	Saudi Arabia	10299.4	Spain	847.8	India	16186.5	Switzerland	820.4	India	16186.5	Switzerland	820.4
20	Israel	10150.9	New Zealand	820.4	Israel	13956.5	New Zealand	819.1	Israel	13956.5	New Zealand	819.1
21	Indonesia	9705.0	Thailand	741.0	Netherlands	13049.2	Spain	817.0	Netherlands	13049.2	Spain	817.0
22	Switzerland	9292.7	Switzerland	736.6	Russia	13029.4	Israel	758.2	Russia	13029.4	Israel	758.2
23	Belgium	9127.2	Israel	715.0	Switzerland	12365.7	Belgium	681.9	Switzerland	12365.7	Belgium	681.9
24	India	9010.9	Belgium	705.0	Belgium	11958.9	Thailand	680.0	Belgium	11958.9	Thailand	680.0
25	Netherlands	8510.6	Argentina	646.6	Indonesia	11675.0	Philippines	646.4	Indonesia	11675.0	Philippines	646.4
26	Sweden	8351.0	Indonesia	609.2	Sweden	10476.4	Argentina	611.6	Sweden	10476.4	Argentina	611.6
27	Nigeria	6848.2	Philippines	600.4	Philippines	10144.5	Russia	567.7	Philippines	10144.5	Russia	567.7
28	Russia	5982.0	Russia	544.6	Hong Kong	8439.8	Czech Republic	549.5	Hong Kong	8439.8	Czech Republic	549.5
29	Colombia	5666.2	Dominica	534.4	Colombia	8228.6	Indonesia	494.9	Colombia	8228.6	Indonesia	494.9
30	Australia	5637.0	South Africa	497.6	Algeria	8153.9	South Africa	488.1	Algeria	8153.9	South Africa	488.1
31	Spain	5071.1	Czech Republic	483.6	Iraq	7838.3	Poland	481.4	Iraq	7838.3	Poland	481.4
32	Dominican Rep.	4324.2	Sweden	471.8	Spain	7250.8	Dominica	445.6	Spain	7250.8	Dominica	445.6
33	Norway	4315.0	Poland	452.4	Australia	7140.5	Sweden	438.9	Australia	7140.5	Sweden	438.9
34	Iraq	3521.5	Venezuela	418.6	Angola	7064.4	Saudi Arabia	409.1	Angola	7064.4	Saudi Arabia	409.1
35	South Africa	3479.2	Saudi Arabia	382.6	Vietnam	5824.1	Venezuela	388.4	Vietnam	5824.1	Venezuela	388.4
36	Costa Rica	3092.2	Colombia	368.2	Norway	5735.1	Hungary	329.4	Norway	5735.1	Hungary	329.4
37	Austria	3006.7	Costa Rica	319.4	South Africa	5606.2	Denmark	328.1	South Africa	5606.2	Denmark	328.1
38	Finland	2907.9	Chile	308.6	Austria	5420.5	Norway	319.1	Austria	5420.5	Norway	319.1
39	Chile	2892.7	Norway	307.0	Chile	5219.7	Colombia	301.9	Chile	5219.7	Colombia	301.9
40	Angola	2817.9	Hungary	300.0	Trinidad Tobago	4749.3	Costa Rica	299.6	Trinidad Tobago	4749.3	Costa Rica	299.6
41	Honduras	2759.3	Denmark	289.2	Ecuador	4270.3	Chile	279.9	Ecuador	4270.3	Chile	279.9
42	Denmark	2744.6	Dominican Rep.	262.0	Denmark	4233.0	Turkey	270.0	Denmark	4233.0	Turkey	270.0
43	Turkey	2677.8	Austria	254.6	Dominican Rep.	4221.6	Austria	265.1	Dominican Rep.	4221.6	Austria	265.1
44	Argentina	2634.1	Turkey	215.8	Costa Rica	3910.6	Dominican Rep.	219.1	Costa Rica	3910.6	Dominican Rep.	219.1
45	Guatemala	2304.6	Finland	211.8	Finland	3845.0	Finland	218.8	Finland	3845.0	Finland	218.8
46	Algeria	2265.6	Peru	176.8	Turkey	3805.7	Peru	199.5	Turkey	3805.7	Peru	199.5
47	Bangladesh	2044.0	Honduras	173.2	Argentina	3559.8	Luxembourg	162.3	Argentina	3559.8	Luxembourg	162.3
48	Hungary	2043.6	Portugal	153.2	Peru	3508.2	Portugal	155.5	Peru	3508.2	Portugal	155.5
49	Ecuador	1975.1	Ecuador	150.8	Honduras	3334.5	Honduras	136.8	Honduras	3334.5	Honduras	136.8
50	Peru	1903.0	Luxembourg	120.0	Kuwait	3245.2	Vietnam	132.6	Kuwait	3245.2	Vietnam	132.6

Table 2
Validation using international stock market and exchange rate betas

The table examines whether firms reporting more offshoring activities with a given nation have higher exposure to the nation's stock market index (Panels A, B) or changes in the nation's foreign exchange rate (Panels C, D). One observation is one firm-nation-year, and the stock market sample (exchange rate sample) includes 51 (48) nations for which data are available. In Panels A and C, we include all firm-nation-year permutations regardless of whether the firm has offshore output activities in a given nation in a given year. In Panels B and D, we restrict attention to firm-nation-year observations that are associated with the offshore output dummy having a value of one. The dependent variable is the annual beta measured based on regressing the firm's stock return on the given nation's stock market index returns (Panels A and B) or logarithmic exchange rate returns (Panels C and D). We compute betas using monthly returns in all panels and each beta regression is run once per year based on twelve monthly observations. Beta estimates are then shrunk based on Vasicek (1973) to reduce the impact of outliers. Once we obtain the betas from this initial calculation, we use the betas (which exist in a firm-nation-year panel) as the dependent variable in the regressions displayed below. The betas are computed such that a higher beta implies a higher positive risk exposure to the given nation, which is straightforward for stock market return betas, and for exchange rate changes we compute the logarithmic growth based on the cost of one unit of foreign currency expressed in dollars (e.g., the number of US dollars needed to purchase one Canadian dollar). The RHS variables, Offshore Output Dummy, External Input Dummy and Internal Input Dummy are one if the firm discusses its offshore output, external input and internal input respectively with the relevant vocabulary based on our offshore word lists along with a given nation word in a given year. The analogous Fraction variables are equal to the number of times the given activity in a given nation is mentioned divided by the total number of times the firm mentions the given activity to all nations. We also include specifications that control for the domestic U.S. market beta which is the 12-month beta with respect to the CRSP value-weighted index. All regressions include firm and year fixed effects, and *t-statistics* (in parenthesis) are adjusted for clustering by firm.

Row	Offshore Output Dummy	Internal Input Dummy	External Input Dummy	Offshore Output Fraction	Internal Input Fraction	External Input Fraction	Market Beta	Observations
Panel A: Entire sample (foreign stock market beta)								
(1)	0.103	0.064	-0.053					4062763
	(37.16)	(22.52)	(-11.12)					
(2)	0.094	0.055	-0.058	0.043	0.031	0.000		4062763
	(26.09)	(14.46)	(-6.84)	(5.94)	(4.22)	(0.03)		
(3)	0.094	0.055	-0.054	0.042	0.031	-0.004	0.334	4062763
	(31.12)	(17.15)	(-7.09)	(6.56)	(4.75)	(-0.33)	(287.48)	
Panel B: Subsample with offshore output (foreign stock market beta)								
(4)		0.035	-0.051					201630
		(8.90)	(-8.30)					
(5)		0.029	-0.049	0.067	0.006	-0.014		201630
		(5.39)	(-4.28)	(6.63)	(0.59)	(-0.83)		
(6)		0.031	-0.049	0.074	0.003	-0.015	0.418	201630
		(6.97)	(-4.75)	(8.59)	(0.31)	(-1.04)	(125.72)	
Panel C: Entire sample (foreign exchange rate beta)								
(7)	1.112	-0.180	-2.099					3797143
	(3.40)	(-0.46)	(-2.47)					
(8)	0.663	-0.790	-3.896	2.074	2.210	3.306		3797143
	(1.57)	(-1.56)	(-2.60)	(2.56)	(2.17)	(1.65)		
(9)	0.664	-0.793	-3.908	2.077	2.213	3.315	-1.087	3797143
	(1.57)	(-1.56)	(-2.61)	(2.57)	(2.17)	(1.65)	(-12.86)	
Panel D: Subsample with offshore output (foreign exchange rate beta)								
(10)		-0.224	-1.034					182936
		(-0.36)	(-0.94)					
(11)		-0.261	-2.052	3.650	-0.737	1.521		182936
		(-0.33)	(-1.15)	(3.02)	(-0.43)	(0.62)		
(12)		-0.264	-2.054	3.642	-0.733	1.522	-0.428	182936
		(-0.34)	(-1.15)	(3.02)	(-0.42)	(0.62)	(-1.16)	

Table 3
Summary statistics
Summary statistics are reported for our sample of 195,651 annual firm-nation (40,389 annual firm) observations from 1997 to 2011. Our sample is all firms with machine readable 10-Ks and available Compustat data. The External Input Dummy and Internal Input Dummy are one if the firm discusses its offshore external input and offshore internal input respectively with the relevant vocabulary in our offshore word lists along with a given nation word in a given year. Relative External vs Internal is computed as External Input Dummy divided by the sum of both External Input Dummy and Internal Input Dummy. The FX Hedging Dummy is one if the firm discusses its use of foreign currency derivative instruments in its 10-K in a given year, and Log(1+#FX Hedge) is the log of one plus the firm's number of total textual mentions of foreign currency derivative instruments in its 10-K in a given year. The definitions of all variables are available in Appendix B in detail. All non-binary variables are winsorized at the top and bottom 1% of the distribution. Unless separately mentioned, all statistics are based on annual firm-nation observations.

Variable	Mean	Std. Dev.	Minimum	Median	Maximum	# Obs.
Offshoring and hedging variables						
External Input Dummy	0.088	0.283	0.000	0.000	1.000	195651
Internal Input Dummy	0.484	0.500	0.000	0.000	1.000	195651
Relative External vs Internal	0.114	0.268	0.000	0.000	1.000	100263
FX Hedging Dummy	0.691	0.462	0.000	1.000	1.000	195651
FX Hedging Dummy (including Debt)	0.810	0.393	0.000	1.000	1.000	195651
Log(1+#FX Hedge)	1.084	0.914	0.000	1.099	3.829	195651
Offshoring and hedging variables (annual firm level)						
External Input Dummy	0.249	0.432	0.000	0.000	1.000	40389
Internal Input Dummy	0.718	0.450	0.000	1.000	1.000	40389
Relative External vs Internal	0.188	0.284	0.000	0.000	1.000	30308
FX Hedging Dummy	0.553	0.497	0.000	1.000	1.000	40389
FX Hedging Dummy (including Debt)	0.744	0.437	0.000	1.000	1.000	40389
Log(1+#FX Hedge)	0.783	0.853	0.000	0.693	3.829	40389
Nation characteristics						
FX Illiquidity	0.122	0.595	-1.038	0.097	2.544	148785
FX Futures Volume	7.540	1.952	0.000	7.782	10.982	145331
FX RSQ	0.594	0.301	0.000	0.611	0.956	195651
Log(GDP)	27.111	1.401	19.018	27.305	29.335	195651
Log(GNPpc)	9.670	1.131	4.382	10.072	11.708	195651
Distance from US	5.134	2.442	1.014	4.885	9.501	195651
Political Stability	0.491	0.797	-1.892	0.836	1.514	195651
Rule of Law	1.035	0.873	-1.422	1.390	1.948	195651
Corruption Control	1.166	1.018	-1.177	1.417	2.417	195651
Voice/Accountability	0.936	0.670	-1.662	1.198	1.676	195651
Government Effectiveness	1.205	0.815	-1.121	1.564	2.229	195651
Regulatory Quality	1.066	0.720	-1.323	1.235	2.077	195651
Firm characteristics						
Log(MV Assets)	6.738	2.121	0.252	6.687	13.872	195651
Log(1+Age)	2.298	1.013	0.000	2.398	3.892	195651
Tobin Q	2.312	1.845	0.640	1.694	11.340	195651
Operating Margin	-0.039	0.769	-5.540	0.114	0.557	195651
Book Leverage	0.197	0.196	0.000	0.157	0.854	195651
Dividend Payer	0.350	0.477	0.000	0.000	1.000	195651
Cash/Assets	0.210	0.216	0.001	0.127	0.852	195651
PPE/Assets	0.427	0.319	0.027	0.340	1.491	195651
CAPX/Sales	0.078	0.148	0.000	0.037	1.166	195651
R&D/Sales	0.140	0.405	0.000	0.024	3.068	195651
Output Fraction	0.185	0.232	0.002	0.093	1.000	195651

Table 4
Pearson correlation coefficients

Pearson correlation coefficients are reported for our sample of U.S. firms with foreign offshore output activities from 1997 to 2011. In Panel A, except for offshoring and financial hedging variables in rows 11 to 15, one observation is one nation year, and we have 1,809 observations. In rows 11 to 15 in Panel A, and Panel B, one observation is one firm-nation year and we have a total of 195,651 observations. See Appendix B for a description of our variables in detail.

Panel A: Correlation coefficients for national characteristic variables

	FX Illiquidity	FX RSQ	Log (GDP)	Log (GNPpc)	Distance from US	Political Stability	Corruption Control	Rule of Law	Voice/ Acc.	Effective Gov.	Regul. Quality
FX RSQ	-0.055										
Log(GDP)	0.004	0.487									
Log(GNPpc)	-0.065	0.469	0.541								
Distance from US	0.033	-0.018	-0.079	-0.332							
Political Stability	0.007	0.374	0.113	0.692	-0.203						
Corruption Control	-0.023	0.554	0.407	0.813	-0.203	0.756					
Rule of Law	-0.011	0.554	0.406	0.824	-0.164	0.794	0.952				
Voice/Accountability	-0.041	0.492	0.362	0.745	-0.334	0.738	0.841	0.871			
Government Effectiveness	0.008	0.593	0.485	0.849	-0.193	0.734	0.952	0.953	0.858		
Regulatory Quality	-0.006	0.520	0.461	0.824	-0.254	0.711	0.902	0.919	0.875	0.939	
External Input Dummy	0.011	-0.029	0.038	-0.018	-0.043	-0.028	-0.034	-0.032	-0.028	-0.031	-0.035
Internal Input Dummy	0.003	0.039	0.067	0.049	-0.067	0.037	0.052	0.045	0.048	0.055	0.066
Relative External vs Internal	0.013	-0.052	0.021	-0.047	-0.016	-0.055	-0.071	-0.063	-0.064	-0.069	-0.080
FX Hedging Dummy	-0.002	-0.009	0.002	0.004	0.067	-0.033	-0.045	-0.030	-0.031	-0.037	-0.025
Log(1+#FX Hedge)	0.007	-0.033	-0.008	-0.007	0.071	-0.057	-0.075	-0.057	-0.051	-0.069	-0.050

Panel B: Correlation coefficients for firm characteristics variables

	External Input Dummy	Internal Input Dummy	Relative External vs Internal	FX Hedging Dummy	Log(1+ #FX Hedge)	Log(MV Assets)	Log (1+Age)	Tobin Q	Operating Margin	Book Leverage	Cash/ Assets	PPE/ Assets	CAPX/ Sales
Internal Input Dummy	0.119												
Relative External vs Internal	0.932	-0.803											
FX Hedging Dummy	0.025	0.154	-0.055										
Log(1+#FX Hedge)	0.025	0.155	-0.053	0.792									
Log(MV Assets)	0.003	0.128	-0.066	0.400	0.548								
Log(1+Age)	0.025	0.104	-0.018	0.187	0.282	0.342							
Tobin Q	-0.054	-0.105	-0.024	-0.093	-0.112	0.091	-0.212						
Operating Margin	0.020	0.106	-0.034	0.167	0.202	0.241	0.193	-0.198					
Book Leverage	0.039	0.092	0.004	0.079	0.130	0.227	0.101	-0.200	0.067				
Cash/Assets	-0.049	-0.139	0.003	-0.138	-0.205	-0.224	-0.303	0.400	-0.364	-0.424			
PPE/Assets	0.043	0.106	0.006	0.022	0.063	0.132	0.262	-0.183	0.126	0.252	-0.392		
CAPX/Sales	-0.006	-0.019	-0.000	-0.089	-0.097	0.028	-0.152	0.097	-0.400	0.101	0.098	0.210	
R&D/Sales	-0.037	-0.121	0.014	-0.142	-0.171	-0.163	-0.168	0.254	-0.841	-0.109	0.467	-0.165	0.338

Table 5
Offshore input predictions with FX illiquidity

The table analyzes the propensity to do offshore external or internal input. One observation is one firm-nation-year, and we have a total of 148,785 observations with non-missing FX Illiquidity. External Input Dummy is one if the firm discusses its offshore external input with the relevant vocabulary in our offshore word lists along with a given nation word in a given year. Internal Input Dummy is one if the firm discusses its offshore internal input with the relevant vocabulary in our offshore word lists along with a given nation word in a given year. Relative External vs Internal is External Input Dummy divided by the sum of both External and Internal Input Dummies. We express the dependent variables in percentages. FX Illiquidity is the annual illiquidity estimate for a given nation's currency against US dollars. We use the annual average of the 12 corresponding monthly FX illiquidity estimates provided by Karnaukh, Ranaldo, and Söderlind (2015). Output Fraction is the firm's output focus on a given nation, which is computed as the number of times the firm mentions its offshore output to the given nation divided by the total number of times the firm mentions its offshore output to all nations in our sample. See Appendix B for a description of our variables in detail. All control variables are one year lagged. *t-statistics* (in parenthesis) are adjusted for nation clustering. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	External Input Dummy		Internal Input Dummy		Relative External vs Internal	
FX Illiquidity	0.434*	0.0511	0.381	0.0596	0.390*	-0.0712
	(1.76)	(0.22)	(0.87)	(0.15)	(1.86)	(-0.35)
FX Illiquidity * Output Fraction		0.195**		0.0794		0.221**
		(2.08)		(0.42)		(2.15)
Output Fraction		1.891***		3.292***		1.105***
		(7.82)		(3.56)		(4.37)
Log(GDP)	2.771***		4.245**		2.800**	
	(3.05)		(2.09)		(2.56)	
Log(GNPpc)	-1.371		-1.059		-1.458	
	(-1.00)		(-0.50)		(-0.96)	
Distance from US	-0.742		-2.788***		0.229	
	(-1.50)		(-3.11)		(0.43)	
Developed	-5.748**		3.662		-6.134*	
	(-2.28)		(0.47)		(-1.85)	
Political Stability	2.600**	0.639	-0.263	2.409**	2.527**	-0.333
	(2.70)	(0.98)	(-0.07)	(2.74)	(2.28)	(-0.53)
Log(MV Assets)	-0.284	0.386	0.637	6.709***	-0.953*	-1.446***
	(-0.73)	(0.95)	(0.68)	(8.42)	(-1.89)	(-2.96)
Log(1+Age)	-0.0586	0.190	1.309**	0.804**	-0.385	0.163
	(-0.24)	(1.11)	(2.65)	(2.44)	(-1.06)	(0.73)
Tobin Q	-0.0768	-0.821***	-0.246	-3.561***	0.193	-0.282**
	(-0.74)	(-7.53)	(-1.26)	(-21.41)	(1.13)	(-2.19)
Operating Margin	-0.548***	-0.844***	-0.598*	-1.309***	-0.239	-1.093***
	(-3.27)	(-4.18)	(-1.77)	(-3.07)	(-1.37)	(-3.44)
Book Leverage	0.268	0.527**	0.819***	1.232***	0.177	0.352
	(1.36)	(2.35)	(3.06)	(3.28)	(0.67)	(1.71)
Dividend Payer	0.582	0.337	0.403	2.716***	0.431	-0.0215
	(1.26)	(0.71)	(1.04)	(4.24)	(0.90)	(-0.05)
Cash/Assets	0.0552	-0.470***	-0.408	-1.509**	0.150	-0.341
	(0.61)	(-3.06)	(-1.27)	(-2.61)	(0.74)	(-0.85)
PPE/Assets	-0.565*	0.214**	-0.494	1.601***	-0.235	-0.0271
	(-2.04)	(2.21)	(-1.08)	(4.42)	(-0.62)	(-0.18)
CAPX/Sales	-0.132	-0.428*	0.145	-0.433	0.0516	-0.433*
	(-1.15)	(-2.00)	(0.49)	(-0.96)	(0.41)	(-1.94)
R&D/Sales	-0.750***	-0.965***	-1.296***	-4.118***	-0.407	-0.0569
	(-3.40)	(-4.12)	(-3.85)	(-11.64)	(-1.22)	(-0.15)
Observations	148785	148785	148785	148785	78700	78700
Adjusted R^2	0.248	0.030	0.337	0.072	0.405	0.040
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other fixed effects	Firm	Nation	Firm	Nation	Firm	Nation

Table 6
Offshore input predictions with FX RSQ

The table analyzes the propensity to do offshore external or internal input. One observation is one firm-nation-year, and we have a total of 195,651 observations. External Input Dummy is one if the firm discusses its offshore external input with the relevant vocabulary in our offshore word lists along with a given nation word in a given year. Internal Input Dummy is one if the firm discusses its offshore internal input with the relevant vocabulary in our offshore word lists along with a given nation word in a given year. Relative External vs Internal is External Input Dummy divided by the sum of both External and Internal Input Dummies. We express the dependent variables in percentages. FX RSQ is the nation level R-squared estimate from regressions of consumption growth on exchange rate changes using available consumption growth and exchange rates data from the World Bank from 1970 until 1995. Output Fraction is the firm's output focus on a given nation, which is computed as the number of times the firm mentions its offshore output to the given nation divided by the total number of times the firm mentions its offshore output to all nations in our sample. See Appendix B for a description of our variables in detail. All control variables are one year lagged. *t-statistics* (in parenthesis) are robust and adjusted for nation clustering. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	External Input Dummy		Internal Input Dummy		Relative External vs Internal	
FX RSQ	-1.738***		-0.389		-1.681***	
	(-3.82)		(-0.27)		(-3.27)	
FX RSQ * Output Fraction		-2.399***		-4.523**		-0.720*
		(-5.10)		(-2.57)		(-1.70)
Output Fraction		4.558***		8.540***		1.795***
		(9.73)		(5.20)		(4.39)
Log(GDP)	2.517***		3.777***		2.340***	
	(4.26)		(3.45)		(3.07)	
Log(GNPpc)	-0.832		-0.860		-0.998	
	(-1.01)		(-0.56)		(-1.18)	
Distance from US	-0.685**		-2.767***		0.167	
	(-2.07)		(-3.89)		(0.41)	
Developed	-0.377		3.121		-0.982	
	(-0.22)		(0.93)		(-0.52)	
Political Stability	0.700	0.332	1.081	1.068	0.572	0.103
	(1.17)	(0.79)	(0.88)	(1.45)	(1.15)	(0.26)
Log(MV Assets)	-0.128	0.306	0.181	6.590***	-0.819*	-1.747***
	(-0.39)	(0.98)	(0.21)	(9.96)	(-1.67)	(-4.24)
Log(1+Age)	-0.0810	0.120	1.880***	0.742**	-0.533	0.0328
	(-0.34)	(0.78)	(3.91)	(2.56)	(-1.52)	(0.16)
Tobin Q	-0.000267	-0.806***	-0.293	-3.704***	0.386**	-0.152
	(-0.00)	(-8.81)	(-1.53)	(-21.82)	(2.39)	(-1.13)
Operating Margin	-0.251*	-0.686***	-0.449*	-1.373***	0.287	-0.825***
	(-1.77)	(-3.21)	(-1.71)	(-3.70)	(1.44)	(-2.68)
Book Leverage	0.171	0.368*	0.848***	1.252***	-0.00274	0.171
	(0.98)	(1.81)	(3.66)	(4.06)	(-0.01)	(0.88)
Dividend Payer	0.588	0.0341	0.103	2.505***	0.659	-0.144
	(1.43)	(0.08)	(0.29)	(4.27)	(1.55)	(-0.33)
Cash/Assets	0.119	-0.259	-0.394	-1.384***	0.179	-0.102
	(1.13)	(-1.42)	(-1.53)	(-2.99)	(1.02)	(-0.27)
PPE/Assets	-0.263	0.338**	-0.450	2.113***	-0.0748	-0.0177
	(-1.11)	(2.51)	(-1.12)	(5.50)	(-0.20)	(-0.11)
CAPX/Sales	-0.124	-0.394**	0.315	0.0571	-0.120	-0.604***
	(-1.23)	(-2.22)	(1.26)	(0.16)	(-0.86)	(-2.66)
R&D/Sales	-0.486***	-0.915***	-1.278***	-4.326***	0.138	0.223
	(-2.94)	(-4.45)	(-5.62)	(-13.69)	(0.49)	(0.63)
Observations	195651	195651	195651	195651	100263	100263
Adjusted R^2	0.236	0.030	0.329	0.082	0.400	0.042
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other fixed effects	Firm, Region	Nation	Firm, Region	Nation	Firm, Region	Nation

Table 7

Difference-in-differences of offshore external input

The table reports difference-in-differences tests of the impact of four new CME derivative product launch events, first using a combined framework, and also for each of the four event-years separately. See Appendix Table A.1 for the details of the CME events. One observation is one firm-nation year, and we have a total of 195,651 observations. The dependent variable, External Input Dummy is one if the firm discusses its offshore external input with the relevant vocabulary in our offshore word lists along with a given nation word in a given year. We express the dependent variable in percentage. Treated is a nation dummy variable that equals one if the nation's currency products are included in the menu of new products introduced by the CME at the given event year. Post is a year dummy variable that equals one if the year is post the CME event year. The Post variable is subsumed by the year fixed effects and thus is not displayed. All nation and firm control variables previously used are included in the regressions, but are not reported to conserve space. *t-statistics* (in parenthesis) are adjusted for nation clustering. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	External Input Dummy									
	All events combined		Event 1999		Event 2002		Event 2006		Event 2009	
Treated	-0.373		0.800		1.347*		0.138		-0.452	
	(-0.61)		(1.25)		(1.84)		(0.10)		(-0.77)	
Treated * Post	-0.678**	-0.827***	-1.331***	-1.438***	-1.388**	-1.071***	0.144	0.515	-0.585	-0.705
	(-2.28)	(-3.03)	(-3.03)	(-3.29)	(-2.33)	(-3.00)	(0.27)	(0.72)	(-1.18)	(-1.36)
Observations	195651	195651	195651	195651	195651	195651	195651	195651	195651	195651
Adjusted R^2	0.239	0.023	0.239	0.023	0.239	0.023	0.239	0.023	0.239	0.023
Firm control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nation control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other fixed effects	Firm, Region	Nation	Firm, Region	Nation	Firm, Region	Nation	Firm, Region	Nation	Firm, Region	Nation

Table 8
Difference-in-differences of offshore internal input

The table reports difference-in-differences tests of the impact of four new CME derivative product launch events, first using a combined framework, and also for each of the four event-years separately. See Appendix Table A.1 for the details of the CME events. One observation is one firm-nation year, and we have a total of 195,651 observations. The dependent variable, Internal Input Dummy is one if the firm discusses its offshore internal input with the relevant vocabulary in our offshore word lists along with a given nation word in a given year. We express the dependent variable in percentage. Treated is a nation dummy variable that equals one if the nation's currency products are included in the menu of new products introduced by the CME at the given event year. Post is a year dummy variable that equals one if the year is post the CME event year. The Post variable is subsumed by the year fixed effects and thus is not displayed. All nation and firm control variables previously used are included in the regressions, but are not reported to conserve space. *t-statistics* (in parenthesis) are adjusted for nation clustering. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Internal Input Dummy									
	All events combined		Event 1999		Event 2002		Event 2006		Event 2009	
Treated	6.800***		-0.489		-13.28***		-1.562		8.629***	
	(2.87)		(-0.21)		(-4.56)		(-0.56)		(4.18)	
Treated * Post	-2.287*	-0.793	-0.926	-2.158	-1.857***	0.187	2.498***	3.290**	-0.588	-1.957*
	(-1.73)	(-0.98)	(-0.75)	(-1.46)	(-2.92)	(0.25)	(3.33)	(2.47)	(-0.52)	(-1.79)
Observations	195651	195651	195651	195651	195651	195651	195651	195651	195651	195651
Adjusted R^2	0.336	0.074	0.336	0.074	0.337	0.074	0.336	0.074	0.337	0.074
Firm control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nation control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other fixed effects	Firm, Region	Nation	Firm, Region	Nation	Firm, Region	Nation	Firm, Region	Nation	Firm, Region	Nation

Table 9
Difference-in-differences of relative external input focus

The table reports difference-in-differences tests of the impact of four new CME derivative product launch events, first using a combined framework, and also for each of the four event-years separately. See Appendix Table A.1 for the details of the CME events. One observation is one firm-nation year, and we have a total of 100,263 observations. The dependent variable, Relative External vs Internal is computed as External Input Dummy divided by the sum of both External Input Dummy and Internal Input Dummy. We express the dependent variable in percentage. Treated is a nation dummy variable that equals one if the nation's currency products are included in the menu of new products introduced by the CME at the given event year. Post is a year dummy variable that equals one if the year is post the CME event year. The Post variable is subsumed by the year fixed effects and thus is not displayed. All nation and firm control variables previously used are included in the regressions, but are not reported to conserve space. *t-statistics* (in parenthesis) are adjusted for nation clustering. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Relative External vs Internal									
	All events combined		Event 1999		Event 2002		Event 2006		Event 2009	
Treated	-1.959***		1.547**		4.157***		-0.412		-1.801***	
	(-2.88)		(2.36)		(4.41)		(-0.46)		(-2.65)	
Treated * Post	-0.568	-0.867*	-1.653***	-1.045*	-1.715***	-1.131***	-0.290	-1.566***	-0.978**	-0.380
	(-1.53)	(-1.94)	(-3.23)	(-1.72)	(-2.78)	(-4.22)	(-0.41)	(-3.10)	(-2.00)	(-0.66)
Observations	100263	100263	100263	100263	100263	100263	100263	100263	100263	100263
Adjusted R^2	0.401	0.040	0.401	0.040	0.401	0.040	0.401	0.040	0.401	0.040
Firm control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nation control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other fixed effects	Firm, Region	Nation	Firm, Region	Nation	Firm, Region	Nation	Firm, Region	Nation	Firm, Region	Nation

Table 10
Difference-in-differences of financial hedging

The table reports difference-in-differences tests based on new CME derivative product launches to examine treatment effects on FX hedging. See Appendix Table A.1 for the details of the CME events. One observation is one firm year, and we have a total of 40,389 observations. The dependent variable, Log(1+#FX Hedge) is the log of one plus the firm's number of total textual mentions of FX derivative instruments in its 10-K in a given year. The last three columns use more refined textual mentions of FX hedging in which all hits that include mentions on FX interest rates in addition to FX derivatives are excluded. Treated is a firm dummy variable that equals one if the firm has offshore sales in at least one of the treated nations. The treated nations are nations whose currency products are included in the menu of new products introduced by the CME during our sample period. Post is a year dummy variable that equals one if the year is post the earliest CME event year. The Post variable is subsumed by the year fixed effects and thus is not displayed. All nation and firm control variables previously used are included in the regressions. *t-statistics* (in parenthesis) are adjusted for firm clustering. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Log(1+#FX Hedge)			Log(1+#FX Hedge) refined measure		
	All derivatives	Forwards & futures	Futures	All derivatives	Forwards & futures	Futures
Treated	-0.00310	-0.0312	-0.0511	-0.0274	-0.0520	-0.0665
	(-0.08)	(-0.92)	(-1.14)	(-0.75)	(-1.50)	(-1.51)
Treated * Post	0.145***	0.149***	0.0931**	0.158***	0.158***	0.0815**
	(4.25)	(4.90)	(2.47)	(4.75)	(5.18)	(2.15)
Log(GDP)	-0.0158	-0.0236*	-0.00905	-0.0201	-0.0235*	-0.00332
	(-1.29)	(-1.86)	(-0.60)	(-1.54)	(-1.81)	(-0.22)
Log(GNPpc)	-0.00437	0.00905	-0.0367	-0.00766	0.0149	-0.0177
	(-0.17)	(0.35)	(-1.23)	(-0.29)	(0.56)	(-0.59)
Distance from US	0.0367***	0.0316***	0.0255***	0.0359***	0.0329***	0.0244**
	(4.22)	(3.49)	(2.58)	(3.97)	(3.58)	(2.52)
Developed	-0.0794*	-0.100**	0.0184	-0.0434	-0.0929**	0.00748
	(-1.73)	(-2.17)	(0.34)	(-0.91)	(-1.96)	(0.14)
Political Stability	0.0202	0.0247*	0.0256	0.00803	0.0158	0.0195
	(1.35)	(1.68)	(1.51)	(0.52)	(1.06)	(1.14)
Log(MV Assets)	0.228***	0.188***	0.0974***	0.206***	0.188***	0.126***
	(9.84)	(7.63)	(3.63)	(8.36)	(7.35)	(4.44)
Log(1+Age)	-0.0230*	-0.00460	-0.00431	-0.0268*	-0.0106	-0.00879
	(-1.67)	(-0.31)	(-0.25)	(-1.89)	(-0.65)	(-0.54)
Tobin's Q	-0.0556***	-0.0527***	-0.0197**	-0.0541***	-0.0550***	-0.0263***
	(-8.46)	(-7.39)	(-2.44)	(-7.82)	(-7.43)	(-3.17)
Operating Margin	-0.00837	-0.0128**	-0.0112	-0.00884	-0.0130**	-0.0142*
	(-1.27)	(-2.13)	(-1.55)	(-1.35)	(-2.10)	(-1.85)
Book Leverage	0.0113	-0.00264	-0.00318	0.00152	-0.00594	-0.00368
	(1.56)	(-0.36)	(-0.39)	(0.20)	(-0.80)	(-0.44)
Dividend Payer	0.0243	0.0153	-0.00218	0.0130	0.0134	-0.00139
	(1.57)	(0.92)	(-0.11)	(0.79)	(0.78)	(-0.07)
Cash/Assets	-0.0258***	-0.0113	-0.0112	-0.0203**	-0.0108	-0.0139
	(-3.52)	(-1.46)	(-1.21)	(-2.56)	(-1.31)	(-1.39)
PPE/Assets	-0.0161	-0.0176	-0.00486	-0.0143	-0.0102	0.00585
	(-1.36)	(-1.43)	(-0.32)	(-1.16)	(-0.78)	(0.38)
CAPX/Sales	0.00118	0.00504	0.0129***	0.00410	0.00358	0.00881*
	(0.24)	(1.11)	(2.71)	(0.88)	(0.79)	(1.79)
R&D/Sales	-0.0119	-0.0186**	-0.0149	-0.0157*	-0.0202**	-0.0196**
	(-1.29)	(-2.22)	(-1.57)	(-1.71)	(-2.37)	(-1.97)
Observations	40389	40389	40389	40389	40389	40389
Adjusted R^2	0.775	0.748	0.563	0.758	0.734	0.554
Fixed effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year

Table 11
Triple difference-in-differences of offshore external input

The table reports difference-in-differences tests based on new CME derivative product launches to examine treatment effects on offshore external input. See Appendix Table A.1 for the details of the CME events. One observation is one firm-nation year, and we have a total of 195,651 observations. The dependent variable, External Input Dummy is one if the firm discusses its offshore external input with the relevant vocabulary in our offshore word lists along with a given nation word in a given year. We express the dependent variable in percentage. Treated is a nation dummy variable that equals one if the nation's currency products are included in the menu of new products introduced by the CME during our sample period. Post is a year dummy variable that equals one if the year is post the earliest CME event year. The Post variable is subsumed by the year fixed effects and thus is not displayed. For each VARIABLE in the first column, its complete combinations with Treated and Post are included. All nation and firm control variables previously used are included in the regressions, but are not reported to conserve space. *t-statistics* (in parenthesis) are adjusted for nation clustering. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

VARIABLE	Treated * Post * VARIABLE	Treated	VARIABLE	Treated * Post	Treated * VARIABLE	Post * VARIABLE	Fixed effects	Adjusted R^2
(1) Internal Input Dummy	-1.495*	-0.480	7.842***	0.493	-1.460*	0.473	Firm, Region, Year	0.270
	(-1.93)	(-0.72)	(10.64)	(1.38)	(-1.85)	(0.75)		
	-1.961**		7.269***	0.817*	-1.207	0.568	Nation, Year	0.035
	(-2.05)		(5.91)	(1.71)	(-0.77)	(1.07)		
(2) Close Distance	-1.290***	-0.120	1.218*	0.0491	-1.673**	1.418***	Firm, Region, Year	0.240
	(-2.74)	(-0.21)	(1.77)	(0.12)	(-2.24)	(3.53)		
	-0.232			-0.750**		0.845*	Nation, Year	0.023
	(-0.53)			(-2.22)		(1.79)		
(3) COGS/sales	-0.388***	-0.367	-0.160	-0.699**	-0.0160	0.151	Firm, Region, Year	0.239
	(-2.78)	(-0.60)	(-0.75)	(-2.38)	(-0.09)	(0.92)		
	-0.415*		1.548***	-0.844***	-0.410	0.295**	Nation, Year	0.024
	(-1.68)		(6.06)	(-3.07)	(-1.64)	(2.10)		
(4) High FX RSQ	-3.506*	0.607	-0.0637	2.763	-1.325	-0.477	Firm, Region, Year	0.239
	(-1.91)	(0.32)	(-0.06)	(1.51)	(-0.68)	(-0.62)		
	-2.909***			2.049**		-1.012	Nation, Year	0.023
	(-3.22)			(2.27)		(-1.27)		
(5) Competition	-2.393*	-1.470	-0.278	1.292	1.349	-1.151	Firm, Region, Year	0.241
	(-1.91)	(-0.92)	(-0.22)	(1.24)	(0.77)	(-1.34)		
	-2.650**		-2.001	1.361	1.660	1.374	Nation, Year	0.023
	(-2.24)		(-1.19)	(1.33)	(0.85)	(1.02)		
(6) Financially Constrained	-6.829**	-0.360	-0.670	-0.763**	0.657	3.416	Firm, Region, Year	0.239
	(-2.10)	(-0.59)	(-0.19)	(-2.47)	(0.18)	(1.21)		
	-6.848**		2.448	-0.913***	-0.854	3.224	Nation, Year	0.023
	(-2.00)		(0.65)	(-3.26)	(-0.21)	(0.98)		

Table 12
Difference-in-differences of hedging outcomes

The table reports difference-in-differences tests based on new CME derivative product launches to examine treatment effects on hedging outcomes. See Appendix Table A.1 for the details of the CME events. The dimensionality of the first four columns is at the firm-year level by taking the annual firm averages of all variables and we have a total of 40,389 observations. The dimensionality of the last four columns is at the firm-nation-year level, and we have a total of 195,651 observations. The dependent variables are (A) annual stock return, (B) stock return volatility, (C) cash flow volatility, and (D) foreign exchange rate beta. Stock return volatility and cash flow volatility are the standard deviations of daily stock returns for a given year and operating income before depreciation scaled by sales from the 12 previous quarters, respectively. The annual foreign exchange rate beta is measured based on regressing the firm's stock return on the given nation's logarithmic exchange rate returns as in Table 2. Treated is a nation dummy variable that equals one if the nation's currency products are included in the menu of new products introduced by the CME during our sample period. Post is a year dummy variable that equals one if the year is post the earliest CME event year. In columns two to four and six to eight, the complete combinations of VARIABLE, Treated and Post are included. To conserve space, we only report Treated * Post and Treated * Post * VARIABLE. All nation and firm control variables previously used are included in the regressions, but are not reported. *t-statistics* (in parenthesis) are adjusted for firm clustering for the first four columns and firm-year clustering for the last four columns. We use more conservative clustering by nation for the firm-nation-year regressions in Panel D and results are stronger when the same firm-year clustering is used. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Firm-year panel				Firm-nation-year panel			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLE:		COGS/Sales	Competition	Financially Constrained		COGS/Sales	Competition	Financially Constrained
Panel A: Annual stock return								
Treated * Post	0.179***	0.172***	-0.433***	0.182***	0.0113	0.0115	-0.351***	0.0179
	(2.92)	(2.81)	(-3.26)	(2.97)	(0.78)	(0.79)	(-5.24)	(1.19)
Treated * Post * VARIABLE		0.0266	0.771***	1.802***		0.0116	0.443***	0.627**
		(0.86)	(4.92)	(3.81)		(0.70)	(5.46)	(2.49)
Panel B: Stock return volatility								
Treated * Post	-0.0537**	-0.0525**	0.0466	-0.0540**	-0.0152***	-0.0150***	0.0405***	-0.0148***
	(-2.49)	(-2.44)	(0.74)	(-2.49)	(-4.40)	(-4.32)	(2.77)	(-4.26)
Treated * Post * VARIABLE		-0.00645	-0.125*	0.0513		0.00122	-0.0668***	-0.0152
		(-0.44)	(-1.68)	(0.29)		(0.34)	(-3.91)	(-0.45)
Panel C: Cash flow volatility								
Treated * Post	-0.0317	-0.00777	0.0525	-0.0368	-0.0122***	-0.0145***	0.00598	-0.0140***
	(-1.09)	(-0.31)	(0.88)	(-1.19)	(-3.16)	(-3.56)	(0.54)	(-3.45)
Treated * Post * VARIABLE		-0.128**	-0.105	-0.665*		-0.0503***	-0.0221	-0.168***
		(-2.09)	(-1.27)	(-1.78)		(-4.29)	(-1.58)	(-3.54)
Panel D: Foreign exchange rate beta								
Treated * Post	-0.0777***	-0.0670**	0.116	-0.0842***	0.135	0.132	0.336**	0.132
	(-2.98)	(-2.57)	(1.61)	(-3.18)	(1.36)	(1.33)	(2.62)	(1.33)
Treated * Post * VARIABLE		-0.0851***	-0.253***	-0.435*		-0.0441***	-0.248***	-0.276**
		(-3.63)	(-2.87)	(-1.72)		(-4.95)	(-2.94)	(-2.38)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other fixed effects	Firm	Firm	Firm	Firm	Firm, Region	Firm, Region	Firm, Region	Firm, Region