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How Taxing Is Corruption on International Investors?

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Abstract

This paper studies the effect of corruption on foreign direct investment. The sample covers bilateral investment from fourteen source countries to forty-five host countries during 1990-91. There are three central findings. (1) A rise in either the tax rate on multinational firms or the corruption level in a host country reduces inward foreign direct investment (FDI). An increase in the corruption level from that of Singapore to that of Mexico is equivalent to raising the tax rate by over twenty percentage points. (2) There is no support for the hypothesis that corruption has a smaller effect on FDI into East Asian host countries. (3) American investors are averse to corruption in host countries, but not necessarily more so than average OECD investors, in spite of the U.S. Foreign Corrupt Practices Act of 1977. On the other hand, there is some weak support for the hypothesis that Japanese investors may be somewhat less sensitive to corruption. Neither American nor Japanese investors treat corruption in East Asia any differently from that in other parts of the world.

There are other interesting and sensible findings. For example, consistent with theories that emphasize the importance of networks in trade and investment, sharing a common linguistic tie between the source and host countries and geographic proximity between the two are associated with a sizable increase in the bilateral FDI flow.

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for every year in the last four, China has been the largest developing host of international investment. Even its FDI flow-to-GDP ratio has been among the highest among developing countries.

Empirical evidence on a negative correlation between corruption and inward FDI has so far been elusive. In a study of U.S. firms' foreign investment, Wheeler and Mody (1992) failed to find a significant correlation between size of FDI and host country's risk factor, a composite measure that includes perception of corruption as one of the components. The authors concluded (p70) that the importance of the risk factor should "be discounted, although it would not be impossible to assign it some small weight as a decision factor."

Similarly, more recently, using total inward FDI (as opposed to bilateral FDI used in this paper), Hines (1995) failed to find a negative correlation between total inward FDI and corruption level in host countries. Commenting on his Table A6, Hines remarked (footnote 24 on page 20), "while the equations fit poorly, it is noteworthy that local corruption has an insignificant effect on post-1977 growth of FDI..."³

On the other hand, popular press and policy circles seem to believe that corruption does reduce inward FDI, as suggested by the opening quote from James Wolfensohn, President of the World Bank. So why is the empirical evidence so elusive? Wheeler and Mody (1992) mixed the corruption measure together with 12 other indicators to form one regressor (what the authors called "RISK"). These other indicators include "attitude of opposition groups towards FDI," "government support for private business activity," and "overall living environment for expatriates," which may not be overwhelmingly correlated with government corruption, may not be precisely measured, or may not be as important for FDI as one imagines. As a result, the noise-to-signal ratio for the composite measure (RISK) may be too high to show up significantly in the regressions. In the part of the Hines' paper (1995) that deals with this question, the total inward FDI from the IMF's IFS database may also be too noisy.

The first objective of this paper is to reexamine the corruption effect on a broader panel of bilateral FDI data with a more comprehensive list of control variables. To reveal the "bottom line", I will report evidence that corruption in a host country does depress inward FDI in a statistically

³ Hines (1995) did find a significantly negative effect of corruption on U.S. FDI, and interpreted it as a result of the Foreign Corrupt Practices Act. I will return to this later.

paying large bribes to foreign officials in addition to contributing to domestic political parties. As a sign of the mood of the day, the bill was passed unanimously in both the Senate and the House, and was signed into law by President Carter. At the time the law was enacted, it may have been hoped that other major source countries would follow suit. But that has not happened so far. The FCPA has made the United States the only source country in the world that penalizes its multinationals or their officers with fines or jail terms for bribing foreign government officials.

On a priori ground, the American multinationals may not necessarily dislike the law. Aside from the moral position of the corporate officers, the law may serve as a useful commitment device for them in the face foreign corrupt official's demand for bribery. The law allows them to say something to the effect, "I would like to pay you. But I am sorry I can't. If I do, I will go to jail." This commitment device is not available to companies from other source countries. If the American firms have the one and the only kind of technology that the host country needs, the American firms may very well still capture the business but with a lower cost (because of no bribery). In this case, the FCPA would not hinder the U.S. investment. Alternatively, if the American firms can find a way to circumvent the law (e.g., by using a close substitute for outright bribery payment), their competitive position vis a vis other investors would not be affected either. Hence, the effect of the FCPA on the American competitiveness becomes an empirical one: Is it binding at the margin?

Using country dummies as a measure of corruption, Beck, Maher and Tschoegl (1991) found a statistically significant but quantitatively small effect of corruption on the U.S. export competitiveness. In the concluding chapter of J. David Richardson's book (1993), Sizing Up U.S. Export Disincentives, the author noted under the section titled "surprisingly small estimates" (p131) that, "across-the-board regulatory burdens, such as procedures mandated for all businesses by the Foreign Corrupt Practices Act, seemed generally unimportant." The best and the most recent evidence on U.S. FDI and exports was provided by James Hines, Jr. (1995). Controlling for the growth of the host country GDP, Hines found evidence that corruption negatively affects the growth of U.S.-controlled FDI during 1977-1982, their capital/labor ratio, incidence of joint ventures, and aircraft exports. He interpreted the findings as evidence that FCPA has undermined the American firms' competitiveness relative to other countries.

There are some reasons to think that the Hines' interpretation may require some additional

campaign contribution) to erect or change the rules/laws to favor the payers, and bribery to deviate from an honest implementation of the existing rules/laws. Shleifer and Vishny (1993) made a distinction between organized or efficient corruption (the payers can get things done after a relatively well-defined bribe), and disorganized or inefficient corruption (there is still a big residual uncertainty even after the bribe). The measures of corruption⁶ used in this paper cannot capture this conceptual richness. I would suppose that the survey-based corruption measure refers mainly to the administration of rules/laws pertinent to foreign firms, and probably is weighted by efficiency level as perceived by those who were surveyed.

Corruption can have many other detrimental effects on the host countries. In economic sphere, corruption may reduce growth rate, possibly as a result of reduced domestic investment (Paulo Mauro, 1995; Knack and Keefer, 1995; Rodrik, 1996; and Kaufmann, 1996⁷). In political economy terms, corruption often contributes to an unfair income or wealth distribution. In political terms, corruption can breed political instability. These important aspects of corruption may interact with its effect on inward FDI. This paper does not explicitly study any of these effects.

The paper is organized as follows. Section 2 describes the data set. Section 3 reports the statistical results. And Section 4 provides concluding remarks.

2. Data

The key explanatory variable is the two-year bilateral flows of foreign direct investment (FDI) over 1990-91. I calculate the FDI flows as the difference between the end-of-year stock data in 1989

⁶ A more detailed explanation is in the next section.

⁷ Both Knack and Keefer (1995) and Rodrik (1996) employ a composite measure of institutional quality, which is composed of rule of law, repudiation of contracts by governments, expropriation risk, quality of bureaucracy, as well as corruption in the government. These indicators are highly correlated with each other. Kaufmann (1996, summary, page i) found, among participants in Harvard University's special mid-career programs and short-term workshops during the summer of 1996, a majority "consider corruption about the most important challenge for economic development and growth for their countries, and also many regard vested financial interest and corruption as a key reason for the lack of sufficient economic reform progress in recent times."

both measures, while concentrating the discussion on results using the BI index.

To avoid awkwardness in interpreting the coefficient, I redefine "corruption" measure in this paper to be ten minus the two respective indices, so that zero for BI and one for TI indices indicate "no corruption," and nine for BI and ten for TI "the highest level of corruption."

The GDP and population data are from the International Monetary Fund's International Financial Statistics data base. In a few cases where GDP data are not available, GNP data are used instead. The wage and labor compensation data are from International Labor Organization, with the kind assistance of Xiaolun Sun.

Four other survey-based qualitative measures of barriers to investment come from The 1996 World Competitive Report. They are restrictions on cross-border ventures, on foreign investors' ability to exert corporate controls, on their eligibility to bid for public sector contracts, and on their ability to access host country's domestic capital markets.

The dummy on linguistic tie takes the value of one if the source and host countries share a common language, and zero otherwise. The data on distance measures the "greater circle distance" between the economic centers in the source-host pair. Both data have been used in Frankel, Stein and Wei (1995) and Wei (1996).

The data on 1990 adult literacy ratio is defined as one minus 1990 adult illiteracy ratio. Adult illiteracy ratio comes from Table 1 of the World Bank's World Development Report 1995, which cites the U.N. Educational, Scientific, and Cultural Organization (UNESCO) as the original source. The Report does not present illiteracy rate for high-income countries, but contains a footnote that reads "according to UNESCO, illiteracy is less than 5 percent." I assign 2.5 percent as the illiteracy rate for these high-income countries. According to the World Bank Report's technical notes (p231), "adult illiteracy is defined here as the proportion of the population over the age of fifteen who cannot, with understanding, read and write a short, simple statement on their everyday life."

The information on 1990 total secondary school enrollment comes from Table 28 of the same World Bank Report. The technical notes to the Table (p241), the data are estimates of the ratio of children of all ages enrolled in secondary school to the country's population of secondary-school-age children. It notes that the definition of secondary school age "differs among countries," and "is most commonly considered to be 12 to 17 years." It further notes that "late entry of more mature students

eliminate the possibility of estimating all the interesting coefficients including the effects of tax and corruption.

Does Corruption Discourage FDI? The OLS Estimates

Table 1 presents the results of the basic regressions using the Business International (BI) index as a measure of corruption. In Column 1, I control for the size of the host country by its GDP and population, both in logarithm, the distance between the source and host countries, and a dummy for whether they share a common language. The coefficient on the marginal tax rate (on foreign investors) is negative and statistically significant at the five percent level. A one percentage point increase in the marginal tax rate reduces inward FDI by about five percent. The coefficient on the corruption measure is also negative and significant. The numerical effect is remarkably large. A one-grade increase in the corruption level is associated with a sixteen percent reduction in the flow of FDI¹⁰, or approximately equivalent to a three percentage point increase in the marginal tax rate. In other words, **a worsening in host government's corruption level from that of Singapore (with a BI-rating of zero) to that of Mexico (with a BI-rating of 6.75) is equivalent to about 21 percentage point¹¹ increase in the marginal tax rate on foreigners.**

There are other interesting observations from the first regression. The coefficient on the distance variable is negative and statistically significant at the five percent level: a one percent increase in distance is associated with a 1.14 percent reduction in the FDI flow. Thus, international investment to some extent is a neighborhood event. On the other hand, the coefficient on the linguistic dummy is positive and significant at the fifteen percent level: sharing a common language or colonial history is associated with a sizable increase in bilateral FDI flow. Some authors (e.g., Rauch, 1996a and 1996b) have emphasized the importance of networks in business transactions. While it is difficult to measure the strength of network precisely, distance and linguistic tie may capture part of it, and the evidence presented here is consistent with the network notion.

Because the log(population) term is not statistically different from zero, I drop this variable

¹⁰ $\exp(-0.17)-1 = -0.156$.

¹¹ $(-0.156*6.75)/(-0.05) = 21.1$.

coefficients for the tax rate and corruption measures remain negative and statistically significant.

There is a reason to suspect that the specification in Column 4 may not be a fair test of the low labor cost hypothesis. We know that some of the FDIs move from developed countries to developing countries (primarily as part of vertically integrated firms), but many move from developed to developed countries (primarily in the form of horizontally integrated firms). Implicitly if not explicitly, the labor cost hypothesis is postulated only for the first type of FDIs. To account for this, I let the labor cost to play potentially different roles for the two types of the FDIs. Specifically, I create an OECD dummy for all host countries which are members of OECD up to 1990. I add an interactive term, "OECD*log(wage)," and the dummy itself, "OECD," to the list of regressors. The result is reported in Column 5. The coefficient for log(wage) term now is negative and statistically significant, consistent with the FDIs-chasing-low-labor-cost story. For a non-OECD host country, a one percent increase in the wage rate is associated with a 0.8 per cent reduction in inward FDIs.

The positive coefficient on the OECD dummy indicates that all OECD host countries tend to receive more FDIs than the sample average. A F-test indicates that the sum of the two coefficients for log(wage) and the interactive term ($-0.78+1.28=0.5$) is not different from zero. Hence, within the OECD host countries, there is no relationship between the size of inward FDIs and the host country's wage level. In sum, this demonstrates the need to separate the two types of FDIs when one investigates the effect of host country labor cost. To my knowledge, this empirical finding is new in the literature.

With the host country's labor cost taken into account in Column 5, the coefficients for tax rate and corruption measures have changed only slightly. So our basic qualitative results survive this extension.

Besides the labor cost story, one may conjecture that a host country's education level, or its endowment of skilled labor may play an important role in attracting inward FDI. This is a key feature of the new FDI theory of Markusen (1994) and Zhang(1996). As an extension, I ran three additional regressions (not reported to save space) adding three different measures of human capital in host countries, one at a time. They are literacy ratio, enrollment of secondary schools, and per capita GDP, respectively. Somewhat disappointingly, none of them is statistically significant. Again, the coefficients on tax rate and corruption remain largely unchanged.

the specification, a $100/\beta_1$ percentage point change in tax rate and a $1/\beta_2$ change in the rating of corruption would produce the same amount of change in the FDI flow. Therefore, a one-step increase in the corruption measure is equivalent to $100\beta_2/\beta_1$ percentage points increase in the tax rate. Using the estimates in Column 2, a one-step increase in the corruption level is equivalent to a rise in the tax rate by 3.6 percentage points, other things equal. **An increase in corruption level from that of Singapore (whose rating is zero) to that of Mexico (whose rating is 6.75) is equivalent to raising the tax rate by 24 percentage points.**

In Column 3, we add an interactive term between tax rate and a dummy indicating that the source countries offering foreign tax credit. The point estimate of the coefficient is positive (0.90), indicating that the FDI from the U.S., UK and Germany that grant foreign tax credits is somewhat less sensitive to host countries' tax rate. However, as with the OLS results, the coefficient variable is statistically not different from zero at the ten percent level.

One may speculate that political stability promotes foreign investment, and that corruption and political stability are negatively correlated. The causality on the corruption/stability nexus can go both ways: official corruption may breed public discontent, which may eventually topple the government; alternatively, instable political environment induces officials to have short horizons and to grab whatever rents available while they can. It may be useful to investigate the independent effect of corruption on FDI after controlling for political stability.

In the next regression reported in Column 4, I include a measure of political stability. The new variable produces a positive coefficient (0.085), which is consistent with the notion that stable political regime in a host country promotes inward foreign direct investment. On the other hand, the estimate is only marginally significant at the fifteen percent level. More importantly to our central discussion, the estimated effect of corruption on FDI is little affected by the inclusion of the measure of political stability. Using the estimates in Column 4, a one-step increase in corruption is equivalent to raising tax rate by three percentage points. An increase in corruption from the Singapore level to Mexico level is similar to a rise in tax rate by 21 percentage points¹³.

Column 5 controls for source countries offering foreign tax credits. This again does not

¹³ $100*(0.11/3.49)*6.75=21.28$.

are two special economies in the region. Both have a reputation for having a clean government and predictable rule of law. On the other end of the spectrum, China is reported to have rampant corruption. It is possible that our earlier estimates are influenced by these observations. To investigate this, I also add to the regression three separate dummies for Hong Kong, Singapore and China as host countries. The results are reported in the Columns 3 and 4 of Table 4.

It is interesting to observe that the coefficients for the China dummy are negative (-0.81 and -0.89) and statistically significant. This means that China is actually an underachiever as a host of FDI from the major source countries in the sample¹⁵. This is reassuring for the purpose of this paper in that foreign investors from the major source countries did not show less sensitivity to China's rampant corruption. On the other hand, the low FDI into China during 1990-91 could be part of the after-effect of the Tiananmen Square Incident. In addition, the direct investment from overseas Chinese in Hong Kong, Taiwan and elsewhere, the largest source for China's inward FDI, could potentially behave differently from the investors included in this sample.

It is perhaps surprising that, once controlling for the fact that all East Asian countries receive lots of inward foreign investment, the coefficients for Singapore and Hong Kong dummies are also negative. Using the estimates in Column 4, the sum of the Singapore coefficient (-0.74) and the East Asia coefficient (0.77) is not significantly different from zero according to a F-test. The same is true for the Hong Kong effect. This means that Singapore and Hong Kong are very similar to other non-East Asian countries as hosts of FDI.

The most important observation from Columns 3 and 4, from the viewpoint of the main question of this section, is that the effects of tax and corruption on FDI remain unchanged after the inclusion of the dummies for China, Singapore and Hong Kong. Foreign investors are still no less averse to corruption in East Asia than elsewhere.

A measure of political stability in host government is added to the regressions in Columns 5 and 6 with no noticeable change in terms of the main results.

¹⁵ Using data from a different source and a simpler model that controls for size, education level and distance from the source countries but not for the effects of tax and corruption, Wei (1996) reported that China is an underachiever as a host of direct investment from the U.S., UK, Germany and France.

1 above at the ten percent level, that U.S. investors are sensitive to corruption, but no more so than an average investor from other OECD countries.

There are several plausible, not mutually exclusive explanations for the possibility that the American investors are equally but not more averse to host country corruption relative to other investors. First, corruption is often an indicator for general weak enforcement of contracts by host governments, Byzantine bureaucracy and so on, that hurts every investor, regardless of whether the source country government forbids bribery payment by its companies. Second, to the extent that investors feel repulsive about corruption, they may be deterred by it just as much as the Americans, even without a formal law like the U.S. FCPA. Finally, when bribery becomes a necessary part of the business deal, the American firms are just as clever as other investors at finding covert means to pay it in spite of the FCPA.

Using the same method, I also investigate the sensitivity of Japanese investors to host country corruption: I will augment the regression in Column 1 by an additional term, "Japan_i*Corruption_j," where "Japan_i" is a dummy variable taking the value of one if the source country is Japan and zero otherwise. The result is reported in Column 2 of Table 6. This coefficient is positive (0.07), consistent with the possibility that Japanese investors are somewhat less sensitive to corruption than other investors. But the estimate is statistically not different from zero.

It may be interesting to examine whether the U.S. and Japanese investments in East Asia are any different from those elsewhere. To this end, I add four new variables to the specification in Column 2. Two of the variables are meant to capture any special factor that may influence their investments in East Asia (but not elsewhere): US*EastAsia, and Japan*EastAsia. Two others are meant to measure if their sensitivity to corruption in East Asia is any different from that in other parts of the world: US*Corruption*EastAsia, and Japan*Corruption*EastAsia. The result is reported in Column 3. As it turns out, the four new variables do not produce coefficients that are different from zero at the ten percent level. Hence, these two major source countries' investments in East Asia, or their sensitivity to corruption in the region, are not unusual relative to the prediction of the overall model. On the other hand, once we have added these four variables, the coefficient on the interactive term, "Japan_i*Corruption_j," becomes larger (to 0.13) and statistically significant at the five percent level. Hence, there is now some support for the notion that Japanese investors are somewhat less

small portion of total FDI going into China. In the estimation reported in this paper, China is in fact an underachiever as a host for FDI from the major source countries. This is consistent with the inference of this paper that investors from the major source countries prefer to go to less corrupt countries. What is intriguing is that the overseas Chinese are apparently less sensitive to corruption, possibly because they are better able to use personal connection to substitute for the rule of law, a subject awaiting fruitful future research.

Third, American investors are averse to host country corruption but not necessarily more so than other investors, in spite of its unique Foreign Corrupt Practices Act. There is also some weak evidence that Japanese investors are less sensitive to corruption, possibly correlated with the way business transactions are conducted in Japan.

There are other interesting findings. For example, there is some support for the labor cost hypothesis of FDI for non-OECD host countries. In the OLS estimations, I find a negative correlation between the wage level and the size of inward FDI for non-OECD hosts but zero correlation for OECD hosts. However, this result does not carry over to the modified Tobit estimation. Also, consistent with the importance of networks, sharing a common linguistic tie between the source and host countries and geographic proximity between the two are found to be associated with a sizable increase in the bilateral FDI flow.

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Table 1: Corruption & Foreign Investments
(OLS Estimation)

	OLS (1)	IV (2)	IV (3)	IV (4)	IV (5)
Tax-rate	-5.00* (1.61)	-4.68* (1.62)	-4.67* (2.10)	-5.46* (2.09)	-6.19* (1.75)
Corruption	-0.17# (0.10)	-0.42* (0.07)	-0.42* (0.07)	-0.23* (0.11)	-0.22* (0.11)
Tax-credit			-0.01 (2.41)	0.62 (2.32)	0.27 (2.63)
log(GDP)	0.63* (0.22)	1.26* (0.28)	1.26* (0.28)	1.31* (0.28)	-0.54* (0.15)
log(population)	0.07 (0.23)				
log(distance)	-1.14* (0.15)	-1.22* (0.15)	-1.22* (0.15)	-1.15* (0.16)	-0.54* (0.15)
linguistic tie	0.93## (0.62)	0.75 (0.58)	0.75 (0.59)	0.90## (0.62)	1.36* (0.46)
OECD					1.15# (0.60)
log(wage)				0.50# (0.28)	-0.78* (0.37)
OECD x log(wage)					1.28* (0.34)
c	-6.67# (3.53)	-22.96 (7.19)	-22.96 (7.20)	-24.01* (7.19)	-18.02* (6.38)
Source dummies	yes	yes	yes	yes	yes
#obs/R ²	266/.52	266/.51	266/.50	266/.51	266/.62
ser	2.52	2.55	2.55	2.54	2.23
log likelihood	-616.2	-619.3	-619.3	-617.8	-581.4

Notes: (1) Heteroskedasticity - consistent standard errors are in parentheses.

(2) *, #, ## denote significant at the 5%, 10% and 15% levels, respectively.

(3) All regressions include source country dummies whose estimates are not reported.

Table 3: Adding Labor Cost and Political Stability Measures
(Modified Tobit Estimation)

	(1)	(2)	(3)
Tax-rate	-3.34* (0.63)	-3.38* (0.64)	-3.68* (0.70)
Corruption	-0.11* (0.03)	-0.11* (0.03)	-0.09* (0.03)
Political stability			0.108# (0.064)
log(GDP _h)	0.29* (0.12)	0.27* (0.12)	0.15 (0.15)
log(pop)	0.18## (0.12)	0.19## (0.12)	0.32* (0.16)
log(dist)	-0.46* (0.06)	-0.44* (0.06)	-0.44* (0.06)
linguistic tie	0.23 (0.17)	0.25## (0.17)	0.21 (0.17)
OECD		0.24 (0.18)	0.24 (0.18)
log(wage)	0.059 (0.115)	0.072 (0.116)	0.147 (0.133)
OECD*log(wage)		-0.073 (0.084)	-0.061 (0.087)
σ	0.89* (0.10)	0.89* (0.10)	0.90* (0.10)
c	1.4E+4* (3.36)	1.4E+4* (2.13)	1.4E+4* (1.71)
A	1.6E+9* (9.6E+6)	1.6E+9* (2.3E+6)	1.6E+9* (1.2E+6)
source dummies	yes	yes	yes
#obs	450	450	450
loglikelihood	1431.75	1434.01	1433.69

Please see the footnotes to Table 2.

Table 4 (continued)

σ	0.89*	0.91*	0.89*	0.91*	0.88*	0.88*
	(0.10)	(0.10)	(0.10)	(0.10)	(0.09)	(0.10)
c	1.4E+4*	1.4E+4*	1.4E+4*	1.4E+4*	1.4E+4*	1.4E+4*
	(1.39)	(3.64)	(1.56)	(3.07)	(3.35)	(1.66)
A	1.6E+9*	1.6E+9*	1.6E+9*	1.6E+9*	1.6E+9*	1.6E+9*
	(6.3E+5)	(5.0E+6)	(1.1E+6)	(3.8E+6)	(4.7E+6)	(5.3E+5)
Source dummies	yes	yes	yes	yes	yes	yes
#obs	450	450	450	450	450	450
loglikelihood	1435.25	1435.53	1437.63	1432.58	1439.78	1440.19

Please see the footnotes to Table 2.

Table 5 (continued)

δ	0.89* (0.09)	0.90* (0.09)	0.90* (0.09)	0.89* (0.09)
c	1.4E+4* (1.87)	1.4E+4* (2.01)	1.4E+4* (2.51)	1.4E+4* (2.19)
A	1.6E+9* (2.0E+6)	1.6E+9* (1.0E+6)	1.6E+9* (3.1E+6)	1.6E+9* (1.6E+6)
Source dummies	y	y	y	y
#obs	435	435	435	435
loglikelihood	1441.16	1444.4	1438.39	1441.88

Please see the footnotes to Table 2.

Table 6 (continued)

σ	0.90* (0.10)	0.88* (0.09)	0.89* (0.10)	0.89* (0.09)
c	1.4E+4* (1.79)	1.4E+4* (1.49)	1.4E+4* (1.57)	1.4E+4* (1.75)
A	1.6E+9* (1.5E+6)	1.6E+9* (0.6E+6)	1.6E+9* (8.1E+6)	1.6E+9* (1.4E+6)
Source dummies	yes	yes	yes	yes
#obs	450	450	450	450
loglikelihood	1432.11	1433.37	1431.28	1435.70

Please see the footnotes to Table 2.

σ	0.90* (0.10)	0.88* (0.09)	0.89* (0.10)
c	1.4E+4* (1.73)	1.4E+4* (3.55)	1.4E+4* (1.64)
A	1.6E+9* (1.0E+6)	1.6E+9* (5.0E+6)	1.6E+9* (6.7E+6)
Source dummies	yes	yes	yes
#obs	435	435	435
loglikelihood	1432.92	1439.02	1435.12

Please see the footnotes to Table 2.



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