Assessing the Causes of Capital Account Liberalization: How Measurement Matters*

Sebastian Karcher
Department of Political Science
Northwestern University
karcher@u.northwestern.edu

David A. Steinberg
Department of Political Science
University of Oregon
steinbe2@uoregon.edu

Abstract: Why do countries open their economies to global capital markets? A number of recent articles have found that two types of factors encourage politicians to liberalize their capital accounts: strong macroeconomic fundamentals and political pressure from proponents of open capital markets. However, these conclusions need to be re-evaluated because the most commonly used measure of capital account openness, Chinn and Ito's (2002) Kaopen index, suffers from systematic measurement error. We modify the Chinn-Ito variable and replicate two studies (Brooks and Kurtz 2007; Chwieroth 2007) to demonstrate that our improved measure overturns some prior findings. Some political variables have stronger effects on capital account policy than previously recognized, while macroeconomic fundamentals are less important than previous research suggests.

* Acknowledgments: We thank Alexandra Guisinger for encouraging us to pursue this topic. Thanks also to Yong Kyun Kim, James Mahoney, Tom Pepinsky, Steve Nelson, Jason Seawright, Dennis Quinn, and the editor and anonymous reviewers at *ISQ* for providing extensive comments on earlier drafts of this paper. We also received helpful comments from participants at the Applied Quantitative Methods Workshop at Northwestern University, the 2010 ISA convention, and 2010 MPSA convention. We are grateful to everyone that supplied us with their datasets and helped us replicate their research, particularly Sarah Brooks, Jeff Chwieroth, and Marcus Kurtz. We also thank Menzie Chinn, Hiro Ito, and Ashoka Mody for access to the raw data of their Kaopen index. All remaining shortcomings are, of course, entirely ours. Authors' names are listed alphabetically.

The deregulation of international capital flows has been one of the most noticeable and consequential changes to the world economy in the modern era. Accordingly, a large — and probably increasing — number of scholars have sought to understand the causes of capital account liberalization. Many recent studies have used time-series — cross-sectional datasets to test alternative explanations for capital account openness. This recent wave of statistical research has undoubtedly improved our understanding of the causes of capital account openness. However, this paper will show that much of the existing literature has relied upon an inappropriate measure of capital account openness. As a consequence of systematic measurement error in the dependent variable, causal inferences from these studies are subject to bias. Re-evaluating some of the previous research on the causes of capital account openness with an improved measure of capital account openness overturns some prior findings. This paper demonstrates that political factors are more important than prior studies have recognized, but some of the macroeconomic fundamentals that were previously believed to influence capital account policy may not matter.

The most commonly used measure of capital account openness in these studies, the *KAOPEN* measure devised by Chinn and Ito (2002, 2006), includes information on capital account policies over the past five years even though this has no relation to most scholars' conceptualization. This measurement error produces three types of biases when using this variable to assess the causes of capital account liberalization. First, when a country fully liberalizes its capital account, *KAOPEN* will not consider the country completely open until five years later. Using *KAOPEN* therefore under-states the causal importance of independent

variables that contribute to large one-off changes in capital account policy. Second, *KAOPEN* continues to increase during years after liberalizations even when capital account policy remains the same. This can lead to severe problems of reverse causality: independent variables that increase after liberalization will be positively associated with *KAOPEN*. Third, the inclusion of the moving average biases the standard errors downwards, further increasing the chance of a type I error.

To address this shortcoming with the existing measure, we introduce an alternative measure of capital account openness, *CKAOPEN*. This new variable is a simple modification of Chinn and Ito's measure that only includes policies from the current year. Although the two variables are strongly correlated, we show that measurement matters by replicating important recent articles on the determinants of capital account liberalization by Brooks and Kurtz (2007) and Chwieroth (2007). Our new measure produces results that differ in important ways — and according to our theoretical predictions — from the published findings. Most strikingly, the new results call into question the argument that strong macroeconomic fundamentals encourage capital account liberalization. Previous studies found that high levels of international borrowing and current account surpluses are associated with open capital accounts, but neither variable is statistically significant when using a more valid measure of capital account openness. These false positive findings were driven by problems of reverse causality that are inherent to *KAOPEN*. By contrast, political factors are more important than earlier research suggested. Measuring capital account openness with *CKAOPEN* increases the impact of variables such as partisanship and the International

Monetary Fund (IMF). This new evidence implies that capital account liberalization depends less on economic circumstances and more upon political circumstances than previously believed.

MEASURING CAPITAL ACCOUNT OPENNESS: LIMITATIONS & SOLUTIONS

Valid causal inferences require valid measures. Measurement validity refers to "whether operationalization and the scoring of cases adequately reflect the concept the researcher seeks to measure" (Adcock and Collier 2001:529). A measure has content validity when no key elements are omitted from the indicator, and no inappropriate elements are included in the indicator (Adcock and Collier 2001:538). We show that *KAOPEN* fails the second test — it includes information on elements that are not part of many scholars' conceptualization of capital account openness. This section introduces the Chinn-Ito *KAOPEN* index, explains why it lacks measurement validity, and refines the indicator to improve concept-measure consistency.

In recent years, there has been great interest in using statistical analyses to understand the causes of capital account liberalization. Most recent works by political scientists have done so using Chinn and Ito's (2002, 2006) *KAOPEN* measure of capital account openness, which is "widely considered to be the best measure" of capital controls (Satyanath and Berger 2007:309). Since 2004, there have been nine articles published in the top-ten political science journals that use quantitative methods to analyze the causes of capital account

liberalization.[i] One article uses the binary indicator of capital controls reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER) (Simmons and Elkins 2004); one article uses its own coding of changes in capital account policy based on the text of the AREAER (Kastner and Rector 2005); another uses Quinn's continuous measure of capital account policy, *CAPITAL* (Quinn and Toyoda 2007); while six articles use *KAOPEN* as the main dependent variable (Brooks 2004; Brooks and Kurtz 2007; Chwieroth 2007, 2008; Grieco, Gelpi, and Warren 2009; Mukherjee and Singer 2010).[ii] The widespread use of *KAOPEN* is due to some important advantages of this variable, which include a continuous measure of capital account openness that covers a large number of countries over an extended period of time.

Chinn and Ito's *KAOPEN* index "attempts to measure the intensity of capital controls" (Chinn and Ito 2006, 169). They use four binary categories from the tables in the IMF's AREAER to construct their index. For obvious reasons, they include data on capital account restrictions (k3). *KAOPEN* also includes data on the presence or absence of multiple exchange rates (k1), current account restrictions (k2), and requirements to surrender export proceeds (k4). Chinn and Ito include k1, k2, and k4 because they "interpret these variables as indicators of the intensity of capital controls" (Chinn and Ito 2002:9). The *KAOPEN* index is then calculated as the first principal component of k1, k2, $SHARE_{k3}$, and k4, where $SHARE_{k3}$ is the five-year average of k3.[iii]

Some concerns have previously been raised about the reliability of the *KAOPEN* measure. Quinn, Schindler, and Toyoda (forthcoming) point out that the coding criterion for k1

through k4 in AREAER have never been clearly defined. They also observe that the definition of k2 changed after 1996, which reduced the number of countries coded as maintaining liberal current account policies. These problems in *KAOPEN* are potentially severe. These sorts of reliability problems often make it more difficult to identify causal relationships in the data. We focus instead on a different problem with *KAOPEN*: the inclusion of a five-year moving average makes *KAOPEN* an invalid measure of capital account openness in any single year. We focus on this problem because there are strong theoretical grounds for believing that it will systematically bias statistical results, especially in cases where *KAOPEN* is used as a dependent variable.

It is appropriate to use multi-year averages like S$HARE_{k3}$ (on both sides of the regression equation) when researchers want to model the long-term causes and effects of variables, as economists often do (see Quinn and Toyoda 2008: esp. 1409; and Klein and Olivei 2008). This was precisely Chinn and Ito's initial purpose: to examine the "long-term effect of capital-account openness on financial development", where *KAOPEN* is an independent variable and the dependent variable is the change in financial development over the subsequent five years (Chinn and Ito 2006:4).

KAOPEN becomes problematic, however, as soon as we treat it as a measure of openness in a given year. Due to the inclusion of data on previous years' capital account restrictions, two countries with the same capital account policies in year *t* can be assigned different values of *KAOPEN*. As a result, *KAOPEN* inaccurately measures the level of capital account openness in the current year in many cases. Furthermore, *KAOPEN* will continue to

increase or decrease in the years following changes in capital account regulation even when there is no government activity related to capital account*s* in these years. *KAOPEN* appears to be a valid measure of *long-run* capital account restrictions, but it is an invalid measure of the intensity of capital account restrictions in any *single year* — a distinction that has been under-appreciated.

An examination of *KAOPEN* scores for particular cases helps illustrate these two types of measurement error. The United Kingdom is useful for this purpose. Britain maintained various restrictions on its capital account until 1979, when it moved to complete capital account openness. Figure 1a displays how *KAOPEN* treats this liberalization episode. There is a noticeable increase in *KAOPEN* in 1979, but the capital account is coded as partially open in 1979 even though there were no government restrictions on capital account transactions during that year. Moreover, *KAOPEN* continues to increase during 1980-83 although capital account policy did not change. *KAOPEN* does not correctly measure the intensity of capital controls during years where policy changes, and it wrongly codes observations after liberalization as years of increasing openness even when policy is constant.

---------- Figure 1 a and b about here ----------

Most political science research on the causes of capital account openness uses *KAOPEN* in precisely this flawed fashion — as a short term, annual indicator of capital account openness, in regressions using country-years as the unit of analysis. Political scientists usually conceptualize capital account openness as the presence or absence of regulation (see for example Mukherjee and Singer 2010:46; and Brooks 2004:395). Since regulation clearly

happens at a single point in time, there is no basis for the five-year adjustment period of the measure of capital account openness. Recent concerns about the "sluggish" nature of *KAOPEN* further suggest that political scientists believe that past years' policies are not relevant indicators (Mukherjee and Singer 2010:56).

Fortunately, these problems can be solved with minor alteration to the Chinn-Ito measure. We propose a new variable, which we refer to as *CKAOPEN* (for "current" capital account openness), that takes the first principal component of k1, k2, k3, and k4, rather than using $SHARE_{k3}$.[iv] Table 1 lists descriptive statistics for *KAOPEN* and *CKAOPEN* for all years and countries for which they are available. The summary statistics show that the variables are — by design — very similar and highly correlated.[v]

----------Table 1 about here ----------

However, the two variables differ in important ways. As shown in Table 1, the correlation between $\Delta KAOPEN$ and $\Delta CKAOPEN$ is 0.89, which is still quite high but considerably lower than the correlation between the levels of these variables. *KAOPEN* provides a misleading indicator of changes in capital account policy for two reasons. First, *KAOPEN* understates dramatic year-to-year changes. Table 1 shows that *KAOPEN* never changes by more than 3.26 in absolute value from one year to the next; by contrast, *CKAOPEN* changes by up to ±4.29 in a given year, which equals the full difference between its minimum and maximum values. As a result, the variance of $\Delta KAOPEN$ is smaller than the variance of $\Delta CKAOPEN$, and this difference is statistically significant. *KAOPEN* often fails to accurately measure the true extent of change in capital account policy from one year to the next. A look

at the British example discussed above illustrates this important difference: Figure 1b shows that the change of *CKAOPEN* is larger than the change of *KAOPEN* for the year in which capital controls were eliminated. The second difference is that *CKAOPEN*, unlike *KAOPEN*, does not change in the years following changes to k3. There are 371 observations — seven percent of *all* observations of *KAOPEN* — where *KAOPEN* changes in value from the previous year when *CKAOPEN* is constant. This new variable more accurately reflects political scientists' conceptualization of capital account policy.

WHY MEASUREMENT MATTERS

The measurement of capital account openness is important because it can influence our conclusions about which factors are causally relevant. Even if *KAOPEN* accurately measures capital account openness for the vast majority of observations, this does not mean that the causal inferences based on this variable will be sound. This section argues that *KAOPEN* suffers from *systematic measurement error*, and might therefore generate biased regression results.

Jackman (2008) describes measurement error using the equation

$$x_i = \xi_i + \delta_i$$

where x_i is the empirical measure of the underlying latent variable, ξ_i, and δ_i is the measurement error. Measurement error is defined as systematic when $E(\delta_i) \neq 0$, signifying that the expected value of the error is different from zero. This situation arises with *KAOPEN*

and it has some disturbing consequences when this measure is used as a dependent variable.

Figure 2 illustrates the nature of the systematic measurement error due to the inclusion of $SHARE_{k3}$ in the construction of *KAOPEN*. The x-axis plots the annual change in capital openness using the first-difference of *CKAOPEN*. Positive values indicate that the capital account is more open than in the previous year; negative values imply that capital controls are more intense in year *t* than in year *t – 1*; observations at the zero line are those where capital account policy has not changed since last year. The y-axis shows the difference between *CKAOPEN* and *KAOPEN*. Observations with positive values on the y-axis are those where *CKAOPEN* values exceed those of *KAOPEN* and negative values on the y-axis mean that the *KAOPEN* score is larger than *CKAOPEN* score. The y-axis can be interpreted as the measurement error of *KAOPEN* due to its inclusion of previous years' policies.[vi] If measurement error were random, there would be no correlation between the x- and y-variables in this scatterplot: the differences between *CKAOPEN* and *KAOPEN* (the y-axis) would bear no relation to any other variables. However, there is a clear positive correlation between the x- and y-variables in Figure 2. As we move to the right of the figure, there is a larger positive difference between *CKAOPEN* and *KAOPEN*. The larger the liberalization of the capital account since the previous year, the greater the degree to which *KAOPEN* understates the true level of openness. The measurement error in *KAOPEN* is systematic.

--------Figure 2 about here ----------

As a result of systematic measurement error, studies using *KAOPEN* a dependent variable to evaluate the causes of capital account openness are subject to three specific biases. The

first problem is that using *KAOPEN* understates the importance of factors that lead to dramatic changes in capital account policy; this occurs because the variable reaches its maximum value only after five years of open capital accounts. Once again, Figure 2 helps illustrate this problem. The values of *CKAOPEN* exceed those of *KAOPEN* in years after capital account restrictions are removed — those towards the right side of Figure 2 — while the opposite occurs during years where the capital account became more closed. For years with large changes of capital account policy — both closure and opening — *KAOPEN* understates the change in capital account policy. Consequently, using *KAOPEN* as a dependent variable will underestimate the coefficients of independent variables that cause large single-year changes in capital account policy.

We conjecture that a likely manifestation of this bias in empirical work will be an underestimation of the importance of "political variables", those relating to the government's political interests. When the capital account policy preferences of politicians and their constituents swing, dramatic and sudden policy changes are likely. Once again, take the example of the large capital account liberalization undertaken by Margaret Thatcher in the UK when she entered office in 1979: the change in *KAOPEN* of 2.22 is considerably less than the change in *CKAOPEN* (3.29); the estimated effect of Thatcher and the Conservative Party on capital account liberalization would therefore be larger when using *CKAOPEN* rather than *KAOPEN*.

A second problem with *KAOPEN* is that this measure will exaggerate the causal importance of certain variables. As we saw earlier, due to the use of five-year averages,

KAOPEN rises in the years after the capital account is liberalized. Variables in the regression model that tend to rise or fall *after* the liberalization of the capital account will be correlated with *KAOPEN* even if they have no causal impact on capital account policy. Likewise, variables that are both causes and consequences of capital account liberalization will display stronger correlations with *KAOPEN* than variables that are uninfluenced by capital openness. These endogeneity problems can arise even if observations are lagged by one or several years. *KAOPEN* thus greatly exacerbates reverse causality problems.[vii]

Coefficient estimates will therefore be biased for any "independent" variable that is partly determined by capital account policy. We suspect that reverse causality problems with *KAOPEN* are likely to be particularly common for "economic" variables. A wide range of economic indicators are likely to both influence and be influenced by capital account regulations. Since "capital account liberalization may bring heavy inflows of short-term bank loans…inflation, currency appreciation, and a widening trade deficit" (Brooks 2004:391), the estimated causal effects of international borrowing, inflation and the current account balance upon capital account openness will be subject to bias when researchers use *KAOPEN* as the dependent variable. To the extent that economic variables are subject to reverse causality, models using *KAOPEN* as a dependent variable may generate significant results for these variables even if they are not important causal variables.[viii]

The problems with *KAOPEN* are not limited to coefficient estimates. Biased estimates of standard errors are a third potential effect of the moving average.[ix] There are at least two reasons for this. As we saw earlier, the inclusion of the moving average smoothes the

movement of *KAOPEN* over time. Many of the standard independent variables, such as GDP per capita, trade dependence, and political institutions, also change slowly over time. The gradual changes in capital account policy therefore artificially depress the distance to the regression line produced by many slow-moving variables. As a consequence, standard errors of coefficients for regressions on *KAOPEN* are very likely to be biased downwards.

The second reason why standard errors may be biased is that the moving average of k3 increases the likelihood that *KAOPEN* will display a unit root. The inclusion of past information increases the correlation between $KAOPEN_t$ and $KAOPEN_{t-1}$. A dependent variable with a unit root tends to exaggerate the fit of the model (Granger and Newbold 1974). To the extent that *KAOPEN* exacerbates unit root problems, this should lead to underestimates of the standard errors.[x] These effects on the standard errors may balance the effect of coefficients underestimated by *KAOPEN*, but they further increase the chance of a type I error (false positives) for variables whose coefficients are overstated by *KAOPEN*.

While the focus has been on the troubling consequences of using *KAOPEN* as a dependent variable, two problems may arise when using it as an independent variable, where the dependent variable refers to annual data. Estimates of the effects of *KAOPEN* on any dependent variable would underestimate the true effect of capital account openness if capital account policy produces instantaneous changes in the outcome of interest. Using *KAOPEN* as an independent variable is also inadvisable for a second reason: it can bias the estimated effects of other independent variables. Whenever an independent variable is measured with error and this error is non-random, this can "wreak havoc" on regression models by biasing

other parameter estimates in unpredictable ways (Jackman 2008:128). For these reasons, unless one seeks to model the long-run effects of capital account policy and specifies the dependent variable accordingly, it is inadvisable to use *KAOPEN* on either side of a regression equation.[xi]

REPLICATION ANALYSES

Are the biases caused by using *KAOPEN* as a dependent variable large enough to warrant our attention? Has previous research on the causes of capital account liberalization exaggerated the importance of economic variables relative to political variables? We address these questions by replicating the statistical models of two high-quality published papers that use *KAOPEN* as a dependent variable, and then re-run these models with *CKAOPEN*. The end of this section briefly discusses replication analyses of research that used *KAOPEN* as an independent variable.

The results of these replications confirm that the measurement of capital account openness matters. Two changes are noteworthy. First, several economic variables that are associated with *KAOPEN* are not significant predictors of *CKAOPEN*. There is limited evidence that good economic conditions are associated with capital account liberalization. Second, we find that political considerations may be even more important than previous work suggested. A number of variables that reflect policymakers' political constraints and preferences grow in importance when replacing *KAOPEN* with *CKAOPEN*.[xii]

Replication Analysis of Brooks and Kurtz (2007)

The first study, by Brooks and Kurtz (2007), examines the causes of capital account (and trade) liberalization in Latin America in the post-debt crisis period. They argue that politicians' decisions to liberalize the capital account reflect two types of factors: political calculations and macroeconomic conditions. Brooks and Kurtz find that two variables relating to politics and the political system — right-wing parties and fragmented legislatures — promote capital account liberalization. With respect to economic conditions, Brooks and Kurtz argue that liberalization is most likely "where macroeconomic fundamentals are positive" (709), and their analysis shows that current account surpluses and low levels of external debt are significant predictors of capital account openness.

The first column of Table 2 is the replication of Brooks and Kurtz's full model, and the second column presents an identically specified model using *CKAOPEN* as the dependent variable.[xiii] Figure 3 displays the percentage change in the coefficients that occurs when moving from model 1 to model 2 for the eight variables that are significant in model 1. Some variables, such as GDP and external debt, which is one of their indicators of macroeconomic fundamentals, have similar effects across the two models. However, the coefficients of some variables change considerably across the two models.

----------Table 2 & Figure 3 about here ----------

Two variables of theoretical importance grow in importance when using the more valid measure of capital account policy. The coefficient on partisanship increases by 36 percent. Legislative fragmentation also increases in importance, with the coefficient of this variable

growing by more than ten percent. These shifts are consistent with the intuition that *KAOPEN* underestimates the importance of political variables that encourage rapid changes to capital account policy.

By contrast, the coefficient for current account surplus falls by over twenty percent and it becomes statistically insignificant. It seems likely that current account surpluses are often a result of capital account liberalization rather than its cause. Eliminating capital controls often changes the capital account balance, and in turn alters the balance on the current account. Some indicators of positive macroeconomic fundamentals that previous studies suggested were important have no bearing on capital account policy.

Finally, the effect of the year 1995 variable, which Brooks and Kurtz interpret as measuring the effect of the 1994-95 'Tequila Crisis', decreases dramatically in model 2. The effect of this variable was inflated in the original model because *KAOPEN* records increases for not only the five countries that liberalized in 1995, but also does so — wrongly — for another five countries that liberalized in prior years.

The replication also confirms concerns about a downward bias in standard errors caused by *KAOPEN*. Nearly all standard errors are smaller in the regression on *KAOPEN* than they are in the regression on *CKAOPEN*. The first model also has a better fit to the data (higher R-squared statistic). A visual inspection of the data indicates that *KAOPEN* has smaller standard errors because this variable changes more slowly over time; the fitted values, which also shift gradually over time, have a closer fit to *KAOPEN* than to *CKAOPEN* in the years after k3 changes.[xiv] Furthermore, diagnostics confirm that *KAOPEN* exacerbates unit root issues. A

Fisher-Type augmented Dickey Fuller unit root test does not allow us to reject the null hypothesis that all panels have a unit root for *KAOPEN* (p = 0.82), while we can weakly reject the null for *CKAOPEN* (p = 0.07).[xv]

In light of this evidence of unit root problems, Columns (3) and (4) of Table 2 re-analyze the first two models using the first-differences of their respective dependent variables. The differences between models 3 and 4 mirror the differences between models 1 and 2. The coefficients for the current account balance and year 1995 variable shrink in size and statistical significance, while the coefficients of partisanship and legislative fragmentation increase in size and statistical significance. Both the level and the first-difference of *KAOPEN* play down the importance of political variables and exaggerate the importance of some economic variables.

Replication Analysis of Chwieroth (2007)

Next, we replicate Chwieroth's (2007) analysis of capital account liberalization in twenty-nine emerging market economies during the period 1977-1999. Chwieroth's primary objective is to test his argument that a "neoliberal team" in the finance ministry and central bank promotes capital account liberalization. However, Chwieroth also tests a number of other important hypotheses, including the role of the IMF, and economic fundamentals such as the level of international borrowing.[xvi]

---------- Table 3 & Figure 4 about here ---------

Table 3 presents four models. We begin with Chwieroth's model and then present the

same model with *CKAOPEN*.[xvii] Figure 4 shows the percentage change in coefficients between these first two models. Once again, the standard error estimates for *KAOPEN* are smaller than their counterparts for *CKAOPEN* across all variables, and there is evidence that this variable worsens unit root problems. The null hypothesis in the Fisher-Type Augmented Dickey-Fuller unit root test can only be weakly rejected ($p = 0.054$) for *KAOPEN*, while it is strongly rejected ($p < 0.001$) for *CKAOPEN*. As a result, we present results based on the first-differences of *KAOPEN* and *CKAOPEN* in the third and fourth columns of Table 3.[xviii]

Political variables either change little or become more important with *CKAOPEN* and Δ*CKAOPEN*. The coefficient of Chwieroth's key variable, neoliberal team, is nearly identical across all four models, and is statistically significant in all cases. The size of the effect of IMF programs increases by one-third between models 1 and 2 and by 28% going from model 3 to 4. During the period under investigation, the Fund encouraged countries to pursue capital account liberalization, but *KAOPEN* underestimates the impact of the IMF because that variable understates the extent of openness during liberalization episodes. The ideology of the head of state has little effect on either *KAOPEN* or Δ*KAOPEN*, but the coefficients for rightist government and for neoliberal chief of government are positive and statistically significant predictors of Δ*CKAOPEN*. The inclusion of the moving average in *KAOPEN* leads scholars to miss the true importance of "political" determinants of capital account liberalization such as the IMF, partisanship, and neoliberal ideology. This replication analysis suggests that neoliberal ideology is more important than previous scholars, including Chwieroth, recognized.

The replication of Chwieroth's results also confirms the tendency of *KAOPEN* to overestimate the effect of economic factors on capital account liberalization. International reserves is not statistically significant in model 2, and its coefficient falls by 16% when moving from Δ*KAOPEN* to Δ*CKAOPEN*. The coefficient and significance level for the average private interest rate declines in both cases. The same is true of international borrowing, and this variable is not statistically significant in the second model, calling into question Chwieroth's conclusion that "increased levels of global foreign borrowing…significantly increase the likelihood of liberalization" (Chwieroth 2007, 456). Domestic money assets, an indicator of the size of the domestic financial sector, is significantly negative in both *KAOPEN* models, but the coefficient is smaller and statistically insignificant in the two *CKAOPEN* models.

Reverse causality is a likely culprit for the falsely significant findings for international borrowing and domestic money assets in the *KAOPEN* models. Capital account liberalization, by definition, makes it easier for domestic residents to borrow from abroad, and one would therefore expect international borrowing to increase after capital markets are opened. Opening the capital account also reduces barriers for domestic money to leave the economy, and the reduction of domestic money is likely to follow in many cases.

Additional Replication Analyses

Our focus has been on the pitfalls associated with using *KAOPEN* as a dependent variable, but in many circumstances it is also problematic to include *KAOPEN* as an independent or control

variable. We replicated two studies that used *KAOPEN* as an independent variable, and found that the coefficient for our alternative measure is noticeably different in both cases.[xix] Re-examining Mosley and Singer's (2008) study of stock-market performance, we find that the coefficient for *CKAOPEN* continues to be statistically significant but it is more than thirty per cent smaller than the coefficient for *KAOPEN*.[xx] Replicating two sets of analyses by Pepinsky (2009:chapter 9) confirms that capital controls increase the probability of authoritarian regime survival during financial crises. In Pepinsky's panel data analysis, the coefficient on the interaction term between *CKAOPEN* and financial crisis is 27 per cent larger than the interaction term with *KAOPEN*. *KAOPEN* and *CKAOPEN* have similar effects to one another in Pepinsky's cross-sectional analysis. However, other variables in the model are affected by this change, with the age of the regime becoming statistically insignificant, and per capita income changing from insignificant to significant. These two variables were not of particular interest for Pepinsky, but this highlights a potentially serious risk of using *KAOPEN* as an independent variable: the fact that systematic measurement errors in this variable can bias estimates of other independent variables in unpredictable ways.

CONCLUSION

Our replications show that increasing the validity of a popular measure of capital account openness changes answers to one of the most hotly debated questions in comparative/international political economy: why do countries liberalize their capital accounts? Contrary to widespread belief in the political science literature, this analysis shows

that favorable economic conditions, including current account surpluses and the availability of foreign borrowing, may not cause capital account liberalization.[xxi] Part of the empirical support for the argument that positive macroeconomic fundamentals encourage the opening of the capital account has been based on a faulty measure. Moreover, political conditions are even more important than existing studies claimed. Previous studies found that capital account liberalization occurs under right-wing governments, when legislatures are fragmented, when the cabinet is staffed by neoliberal economists, and for countries under IMF programs, but these four variables have bigger impacts — both in an absolute sense and relative to other factors — than scholars recognized earlier. How capital account openness is measured impacts substantive findings in important and predictable ways. This is particularly the case when researchers are assessing the causes of capital account openness. However, conclusions drawn from studies that include capital account openness as an independent or control variable can also be sensitive to how this concept is measured.

Researchers must take greater care when selecting measures of capital account openness and other key concepts. The measure that is most commonly used to analyze the causes of capital account openness, the Chinn-Ito *KAOPEN* index, is inappropriate for this purpose. We modified Chinn and Ito's original index to make it more consistent with most scholars' conceptualization. This new measure, *CKAOPEN,* is more useful for analyzing the causes of capital account liberalization than *KAOPEN*.

However, choosing between *CKAOPEN* and other high-quality measures, such as Quinn's (1997) *CAPITAL* variable, should depend on researchers' particular priorities.[xxii] *CAPITAL* is

the sum of two five-category sub-indicators — the intensity of restrictions on capital inflows, and the intensity of restrictions on capital — that are coded based on the written text of AREAER. *CKAOPEN* contains information on a wider array of restrictions on cross-border financial flows (e.g. multiple exchange rates), but the sub-index on capital account restrictions (k3) does not include information on capital inflow controls (Quinn and Toyoda 2008, 1407). *CAPITAL* is especially attractive to scholars seeking a fine-grained indicator of restrictions on inflows and outflows of capital while *CKAOPEN* is more useful for researchers seeking to measure a larger variety of restrictions on capital outflows. The trade-off between coverage and reliability should also inform researchers' choice between these two measures. Wide data coverage is a merit of *CKAOPEN: CKAOPEN* includes data on 41 years (1966-2006), and 182 countries. Quinn's variable includes data for 97 countries for an earlier, but longer, period (1950-1999). While *CAPITAL* has fewer observations than *CKAOPEN*, the components of the former index are coded with greater transparency and reliability (Quinn et al. forthcoming). The time-period of interest also affects which variable is more useful. *CKAOPEN* has fewer observations (698) than *CAPITAL* (1613) for the Bretton Woods era (1950-72), but nearly twice as many observations for the post-Bretton Woods era (5791 and 3073, respectively). When selecting a measure of capital account openness, researchers must first ensure that measures are valid, and should then choose among the remaining measures based on their particular goals. It is typically advisable to use multiple valid measures to ensure that any findings are robust.

It is often tempting to take popular datasets at face value, but, as this and other studies

suggest, the conceptualization and measurement of important variables frequently merits a much closer look (see Kurtz and Schrank 2007; and Goertz 2006). Researchers who import measures from other fields must carefully consider whether the measure is consistent with their underlying concepts and how any potential measurement errors might bias regression results. The message of this paper is not that challenging concepts cannot be accurately measured. Even minor modifications to existing measures have the potential to produce noticeable improvements in the accuracy of causal inferences.

More broadly speaking, this paper underlines the importance of putting issues of measurement front and center. Much of the literature on methodology is focused on improving estimation techniques. While this is a worthwhile goal, even the most refined identification strategy is fruitless when the underlying variables are mis-measured, especially where researchers are unaware of the issue. We hope that, beyond addressing the immediate issues pertaining to the measurement of capital account openness, this article will also help to make researchers aware of the various forms in which measurement error can impact their results.

[i] We use the journal ranking from Garand et al. (2009).

[ii] *KAOPEN* is also the main dependent variable in two unpublished papers (Chwieroth et al. 2008; Pepinsky 2012). A number of recent publications also employ *KAOPEN* as an independent variable, including Cao (2010), Guisinger and Singer (2010), Rosas (2006), Singer (2010), as well as other examples that are discussed below.

[iii] Principal Component Analysis (PCA), a statistical technique closely related to factor analysis, uses the eigenvalues of the covariance matrix to reduce a multi-dimensional dataset (four in this case) to one with fewer dimensions (one in this case – thus the *first* principal component).

[iv] Principal component analysis is a valid method for reducing the dimensionality of bivariate and categorical data (Gower 1966; Joliffe 2002), which is the purpose for which we employ it. The standard error estimates of PCA based on categorical data are, however, invalid; as a result, standard PCA cannot be used on categorical data to test for the presence of a latent variable, but neither Chinn and Ito nor us perform such tests.

[v] The AREAER changed its classification method in 1996 from a single binary indicator of capital controls to 13 separate categories. Chinn and Ito (2006) followed Mody and Murshid's (2005) method of extending the binary measure for this period, and we did the same to maintain consistency.

[vi] This is not to say that *CKAOPEN* is an error-free measure of capital account openness. However, any measurement error contained in *CKAOPEN* is equally present in *KAOPEN*. The argument here is that any difference between *KAOPEN* and *CKAOPEN* is due to additional measurement error introduced by the inclusion of a lagged component in the construction of *KAOPEN*.

[vii] Good theory is obviously a central element in determining the direction of causality, but measures that intensify such problems ought to be avoided whenever possible.

[viii] To be sure, *KAOPEN* could also underestimate the effects of economic variables that are unaffected by capital account policy, and overestimate the effects of political variables, such as democracy, that have a two-way relationship with capital account policy (e.g. Eichengreen and Leblang 2008). But there are strong grounds to believe that more economic than political variables will be subject to reverse causality, and therefore than *KAOPEN* has tended to overestimate the importance of economic factors relative to political factors.

[ix] We are very grateful to an anonymous reviewer for bringing this to our attention.

[x] Unit root problems can typically be remedied with first-differencing, but most previous empirical work has not tested whether *KAOPEN* has a unit root, and most studies exclusively use the level, rather than the first-difference, of *KAOPEN*.

[xi] We develop simple simulations to examine the consequences of using *KAOPEN* as a dependent variable in two highly stylized, but empirically plausible, scenarios. We

generate two variables based on the actual *CKAOPEN* data series. To simulate reverse causality, we create a variable that increases for the three years after the capital account is liberalized. The second variable, by contrast, increases in the year prior to increases in *CKAOPEN*, simulating an actual causal relationship. We run fixed-effect regressions using the lagged values of these two constructed variables as independent variables, and *KAOPEN* and *CKAOPEN* as dependent variables. Consistent with our expectations, *KAOPEN* considerably increases the size of the coefficient and the level of statistical significance for the first variable, even though it is completely endogenous to capital account policy. The coefficient for the second variable is thirty percent below its true value when *KAOPEN* is the dependent variable. The full results of these simulations are available in an online appendix.

[xii] We also replicated the results of Grieco, Gelpi and Warren (2009), which uses the first difference of *KAOPEN* as a dependent variable. Using first differences of *CKAOPEN* alters their findings in line with our predictions but the changes are less stark than the other papers that use the level of *KAOPEN*. The full results of the replication will be made available online.

[xiii] Replicating Brooks and Kurtz's first two models, which include fewer controls, produces nearly identical results. We also tried to address endogeneity issues by estimating their model using Arellano and Bond's dynamic panel regressions (cf. Wooldridge 2002:chapter 11). While Sargan over-identification tests show that the internal

instruments are invalid, the regressions show similar trends to those in Table 2 (see online appendix for results).

[xiv] The figures can be seen in the online appendix.

[xv] We also test for serial correlation. The standard Breusch-Goodfrey/Wooldridge tests for serial correlation (cf. Wooldridge 2002: 288) are biased towards rejection (of the null of no serial correlation) for fixed-effect regressions with small T. We instead use the test as specified by Wooldridge (2002:274f.) and implemented in the *plm* package of the R statistical software as "pwartest()" (Croissant and Millo 2008). With the χ^2 test statistics all below 2.5 we fail to reject the null of no serial correlation even at a .1 level and conclude that autocorrelation is not an issue.

[xvi] Chwieroth uses five year moving averages of all economic variables. Unfortunately, this fails to resolve the endogeneity concern we raise because the periods measured by the independent variables and *KAOPEN* overlap.

[xvii] We focus on Chwieroth's first model, which uses panel-corrected standard errors. His second model has identical coefficients but uses robust standard errors. Only two variables — neoliberal team and IMF program — are significant in the model with *CKAOPEN* and robust standard errors. We also re-estimate these models using Arellano-Bond regressions, which, as in the Brook's and Kurtz case (cf. FN 12) fail diagnostic tests, but display similar overall trends. All results are in the online appendix.

[xviii] We again test for serial correlation as specified in FN 14 and again clearly fail to reject the

null hypothesis of no serial correlation.

[xix] The results of these replications will be placed in the online appendix.

[xx] It is important to remember that random measurement error in the independent variables can also reduce coefficient estimates. Monte Carlo simulations indicate that the coefficient falls by a similar amount if *KAOPEN* is measured with additional random error equivalent to one-fifth of a standard deviation. Even with such a modest additional measurement error, the coefficient for *KAOPEN* falls below 95 percent significance in 17 percent of our simulated regressions. The appendix provides more details on this simulation.

[xxi] Other empirical research (Abiad and Mody 2005; Pepinsky 2012) finds that economic crises influence capital account policy.

[xxii] The Financial Openness Index in Brune (2006) is a third potentially useful measure of capital account openness, but we focus our comparison on the other two measures because the Financial Openness Index is not publicly available and has not been widely used thus far.

References

ABIAD, ABDUL, AND ASHOKA MODY. (2005) Financial Reform: What Shakes It? What Shapes It? *The American Economic Review* 95: 66-88.

ADCOCK, ROBERT, AND DAVID COLLIER. (2001) Measurement Validity: A Shared Standard for Qualitative and Quantitative Research. *American Political Science Review* 95: 529-546.

BROOKS, SARAH M. (2004) Explaining Capital Account Liberalization in Latin America: A Transitional Cost Approach. *World Politics* 56: 389-430.

BROOKS, SARAH M., AND MARCUS J. KURTZ. (2007) Capital, Trade, and the Political Economies of Reform. *American Journal of Political Science* 51: 703-720.

BRUNE, NANCY. (2006) Financial Liberalization and Governance in the Developing World. Ph.D. Dissertation. Yale University.

CAO, XUN. (2010) Networks as Channels of Policy Diffusion: Explaining Worldwide Changes in Capital Taxation, 1998–2006. *International Studies Quarterly* 54: 823-854.

CHINN, MENZIE D., AND HIRO ITO. (2002) *Capital Account Liberalization, Institutions and Financial Development: Cross Country Evidence*. Cambridge, MA: National Bureau of Economic Research. NBER Working Paper 8967.

CHINN, MENZIE D., AND HIRO ITO. (2006) What Matters for Financial Development? Capital Controls, Institutions, and Interactions. *Journal of Development Economics* 81: 163-192.

CHWIEROTH, JEFFREY M. (2007) Neoliberal Economists and Capital Account Liberalization in Emerging Markets. *International Organization* 61: 443-463.

CHWIEROTH, JEFFREY M. (2008) Normative Change from Within: The International Monetary Fund's Approach to Capital Account Liberalization. *International Studies Quarterly* 52: 129-158.

CHWIEROTH, JEFFREY M., H. STREET, A. M. HICKS, AND D. PINHEIRO. (2007) The Institutional Construction of Neoliberal Economic Globalization: The Case of Capital Market Liberalization in Latin America.

CROISSANT, YVES, AND GIOVANNI MILLO. (2008) Panel Data Econometrics in R: The Plm Package. Available at: http://cran.rakanu.com/web/packages/plm/vignettes/plm.pdf. (Accessed September 15, 2011).

EICHENGREEN, BARRY, AND DAVID LEBLANG. (2008) Democracy and Globalization. *Economics & Politics* 20: 289-334.

GARAND, JAMES C., MICHEAL GILES, ANDRÉ BLAIS, AND IAIN MCLEAN. (2009) Comparative Journal Ratings: A Survey Report. *PS: Political Science and Politics* 7: 18-38.

GOERTZ, GARY. (2006) *Social Science Concepts. A User's Guide*. Princeton, NJ: Princeton University Press.

GOWER, JOHN C. (1966) Some Distance Properties of Latent Root and Vector Methods Used in Multivariate Analysis. *Biometrika* 53: 325-338.

GRANGER, C.W.J., AND P. NEWBOLD. (1974) Spurious Regressions in Econometrics. *Journal of Econometrics* 2: 111-120.

GRIECO, JOSEPH M., CHRISTOPHER F. GELPI, AND T. CAMBER WARREN. (2009) When Preferences and Commitments Collide: The Effect of Relative Partisan Shifts on International Treaty Compliance. *International Organization* 63: 341-355.

GUISINGER, ALEXANDRA, AND DAVID A. SINGER. (2010) Exchange Rate Proclamations and Inflation-Fighting Credibility. *International Organization* 64: 313-337.

JACKMAN, SIMON. (2008) Measurement. In *The Oxford Handbook of Political Methodology*, edited by Janet M. Box-Steffensmeier, Henry E. Brady, and David Collier. New York, NY: Oxford University Press.

JOLLIFFE, IAN T. (2002) *Principal Component Analysis*. 2nd ed. New York, NY: Springer.

KASTNER, SCOTT L., AND CHAD RECTOR. (2005) Partisanship and the Path to Financial Openness. *Comparative Political Studies* 38: 484-506.

KLEIN, MICHAEL W., AND GIOVANNI P. OLIVEI. (2008) Capital Account Liberalization, Financial Depth, and Economic Growth. *Journal of International Money and Finance* 27: 861-875.

KURTZ, MARCUS J., AND ANDREW SCHRANK. (2007) Growth and Governance: Models, Measures, and Mechanisms. *The Journal of Politics* 69: 538-554.

MOSLEY, LAYNA, AND DAVID A. SINGER. (2008) Taking Stock Seriously: Equity-Market Performance, Government Policy, and Financial Globalization. *International Studies Quarterly* 52: 405-425.

MODY, ASHOKA, AND ANTU PANINI MURSHID. (2005) Growing up with Capital Flows. *Journal of International Economics* 65: 249-266.

MUKHERJEE, BUMBA, AND DAVID A. SINGER. (2010) International Institutions and Domestic Compensation: The IMF and the Politics of Capital Account Liberalization. *American Journal of Political Science* 54: 45-60.

PEPINSKY, THOMAS B. (2012) Do Currency Crises Cause Capital Account Liberalization? *International Studies Quarterly,* forthcoming.

PEPINSKY, THOMAS B. (2009) *Economic Crises and the Breakdown of Authoritarian Regimes: Indonesia and Malaysia in Comparative Perspective*. New York, NY: Cambridge University Press.

QUINN, DENNIS P. (1997) The Correlates of Change in International Financial Regulation. *The American Political Science Review* 91: 531-551.

QUINN, DENNIS P., AND A. MARIA TOYODA. (2008) Does Capital Account Liberalization Lead to Growth? *Review of Financial Studies* 21: 1403-1449.

QUINN, DENNIS P., AND A. MARIA TOYODA. (2007) Ideology and Voter Preferences as

Determinants of Financial Globalization. *American Journal of Political Science* 51: 344-363.

QUINN, DENNIS P., MARTIN SCHINDLER, AND A. MARIA TOYODA. (Forthcoming) Measuring Capital and Financial Current Account Openness. In *Encyclopedia of Financial Globalization*, Elsevier.

ROSAS, GUILLERMO. (2006) Bagehot or Bailout? An Analysis of Government Responses to Banking Crises. *American Journal of Political Science* 50: 175-191.

SATYANATH, SHANKER, AND DANIEL BERGER. (2007) Capital Controls, Political Institutions, and Economic Growth: A Panel and Cross Country Analysis. *Quarterly Journal of Political Science* 2: 307–324.

SIMMONS, BETH A, AND ZACHARY ELKINS. (2004) The Globalization of Liberalization: Policy Diffusion in the International Political Economy. *American Political Science Review* 98: 171-189.

SINGER, DAVID A. (2010) Migrant Remittances and Exchange Rate Regimes in the Developing World. *American Political Science Review* 104: 307-323.

WOOLDRIDGE, JEFFREY. (2002) *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press.

Table 1: Descriptive Statistics

	KAOPEN	*CKAOPEN*	Δ*KAOPEN*	Δ*CKAOPEN*
Mean	-0.01	0.00	0.03	0.02
Median	-0.76	-0.71	0.00	0.00
Standard Deviation	1.52	1.52	0.37	0.49
Minimum	-1.80	-1.76	-3.25	-4.29
Maximum	2.54	2.53	3.26	4.29
Correlation	0.99		0.89	

Table 2: Replication Analysis of Brooks & Kurtz (2007)

	(1) *KAOPEN*	(2) *CKAOPEN*	(3) Δ*KAOPEN*	(4) Δ*CKAOPEN*
Partisanship of Executive	0.077*	0.105*	0.019	0.111*
	(0.046)	(0.054)	(0.054)	(0.059)
Legislative Fragmentation	-0.782*	-0.868*	-0.942	-1.302**
	(0.444)	(0.519)	(0.580)	(0.664)
Current Account (%GDP)	0.014*	0.011	0.026**	0.017
	(0.008)	(0.011)	(0.010)	(0.013)
External Debt/GDP	-0.633***	-0.633***	-0.461*	-0.616**
	(0.208)	(0.246)	(0.253)	(0.289)
Investment/GDP_{t-1}	-0.010	-0.004	-0.017	-0.002
	(0.011)	(0.013)	(0.014)	(0.016)
GDP Growth $Rate_{t-1}$	0.008	0.001	-0.002	-0.015
	(0.011)	(0.013)	(0.014)	(0.016)
GDP (natural log)	-1.919***	-2.03***	-0.923	0.113
	(0.694)	(0.690)	(1.037)	(0.991)
GDP per capita	0.190	0.167	0.160	0.084
	(0.227)	(0.254)	(0.213)	(0.298)
World Bank Flows/GDP_{t-1}	4.500	-2.145	-8.213	-13.354
	(8.064)	(9.418)	(11.479)	(12.603)
IMF Flows/GDP_{t-1}	-4.934	-5.698	-2.471	-0.965
	(6.442)	(5.555)	(6.755)	(5.743)
Year 1995	0.261***	0.062	0.229**	0.056
	(0.092)	(0.121)	(0.109)	(0.123)
Trade/GDP_{t-1}	0.005	0.0004	0.002	-0.011*
	(0.004)	(0.005)	(0.006)	(0.006)
LDV	0.589***	0.570***	-0.146	-0.097
	(0.091)	(0.099)	(0.146)	(0.141)
Time Trend	0.122***	0.138***	0.008	-0.017
	(0.031)	(0.034)	(0.035)	(0.036)
Trade $Liberalization_{t-1}$	0.033	-0.046	0.121	-0.427
	(0.248)	(0.349)	(0.330)	(0.408)
Constant	47.295***	50.586***	23.511	-1.194
	(17.141)	(17.054)	(25.908)	(24.586)
N	221	221	208	208
R-Squared	0.88	0.83	0.14	0.10

Note: *p< .1 **p< .05 ***p< .01. Panel-corrected standard errors are in parentheses.

Table 3: Replication of Chwieroth (2007)

	(1) *KAOPEN*	(2) *CKAOPEN*	(3) Δ*KAOPEN*	(4) Δ*CKAOPEN*
Neoliberal Team	0.003**	0.003*	0.003***	0.003**
	(0.001)	(0.002)	(0.001)	(0.002)
Neoliberal Chief of Government	0.130	0.215	0.370	0.503*
	(0.228)	(0.251)	(0.236)	(0.262)
International Borrowing	0.00089**	0.00060	0.0012***	0.00097**
	(0.00044)	(0.00047)	(0.0004)	(0.0004)
Average Private Interest Rate	0.066**	0.063*	0.060*	0.041
	(0.030)	(0.034)	(0.032)	(0.038)
Debt Service/Exports	-0.005	0.000	0.005	0.008
	(0.007)	(0.007)	(0.007)	(0.008)
Reserves/Imports	0.027*	0.027	0.063***	0.053**
	(0.014)	(0.019)	(0.017)	(0.023)
Trade/GDP	0.001	-0.002	0.001	-0.001
	(0.004)	(0.005)	(0.004)	(0.005)
Domestic Money Bank Assets/GDP	-0.755**	-0.633	-0.750*	-0.527
	(0.360)	(0.399)	(0.390)	(0.432)
Leftist Government	0.057	0.111	-0.216	-0.044
	(0.112)	(0.139)	(0.164)	(0.189)
Rightist Government	-0.222	-0.221	0.184	0.295*
	(0.153)	(0.178)	(0.119)	(0.156)
Central Bank Independence (CBI)	-0.268	-0.117	-0.313	-0.278
	(0.207)	(0.263)	(0.241)	(0.323)
Democracy	0.009	0.010	0.017	0.017
	(0.010)	(0.010)	(0.011)	(0.012)
Mean Capital Account Policy	-0.197	0.117	-0.578**	-0.364
	(0.247)	(0.259)	(0.254)	(0.259)
U.S. Trade/GDP	-1.386	-1.207	0.001	-1.263
	(0.899)	(1.037)	(0.004)	(1.186)
U.S. Bilateral Investment Treaty (BIT)	-0.210*	-0.251	-0.389***	-0.463***
	(0.118)	(0.163)	(0.131)	(0.175)
IMF Program	0.142**	0.189**	0.179***	0.230***
	(0.065)	(0.081)	(0.068)	(0.089)
Fixed Exchange Rate	0.057	0.145	0.158*	0.267***
	(0.079)	(0.095)	(0.082)	(0.101)
GDP Per Capita	-0.011	-0.012	-0.003	-0.002
	(0.012)	(0.015)	(0.013)	(0.016)
Gross Domestic Savings/GDP	-0.014*	-0.017*	-0.013	-0.013
	(0.008)	(0.009)	(0.008)	(0.010)
Currency Crisis	-0.068	-0.048	0.134	0.175
	(0.103)	(0.123)	(0.108)	(0.132)
U.S. Interest Rate	0.021	0.009	0.021	0.008
	(0.021)	(0.022)	(0.020)	(0.021)
Finance Minister Selection Instrument	-0.144	-0.236	-0.645**	-0.740**
	(0.237)	(0.275)	(0.259)	(0.309)
Central Banker Selection Instrument	0.242	0.468	0.987**	1.416***
	(0.384)	(0.424)	(0.405)	(0.459)
Constant	-0.138	0.450	-0.768	-0.882
	(.762)	(1.467)	(0.815)	(0.705)
N	448	448	433	433
R-Squared	0.87	0.83	0.18	0.16

Note: *p< .1 **p< .05 ***p< .01. Panel-corrected standard errors are in parentheses.

Figure 1: Comparing KAOPEN and CKAOPEN (United Kingdom, 1976-85)

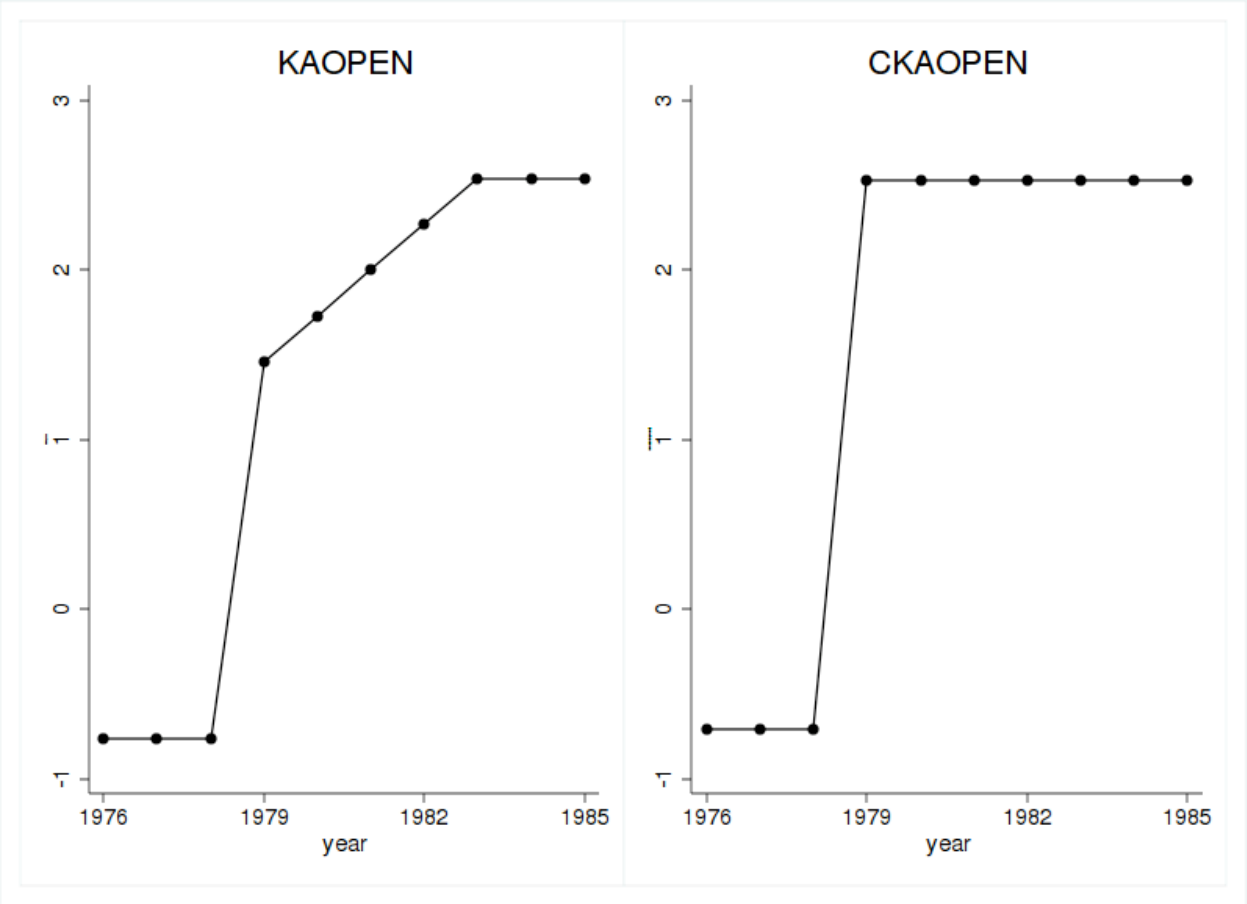

Figure 2: Systematic Measurement Error in KAOPEN

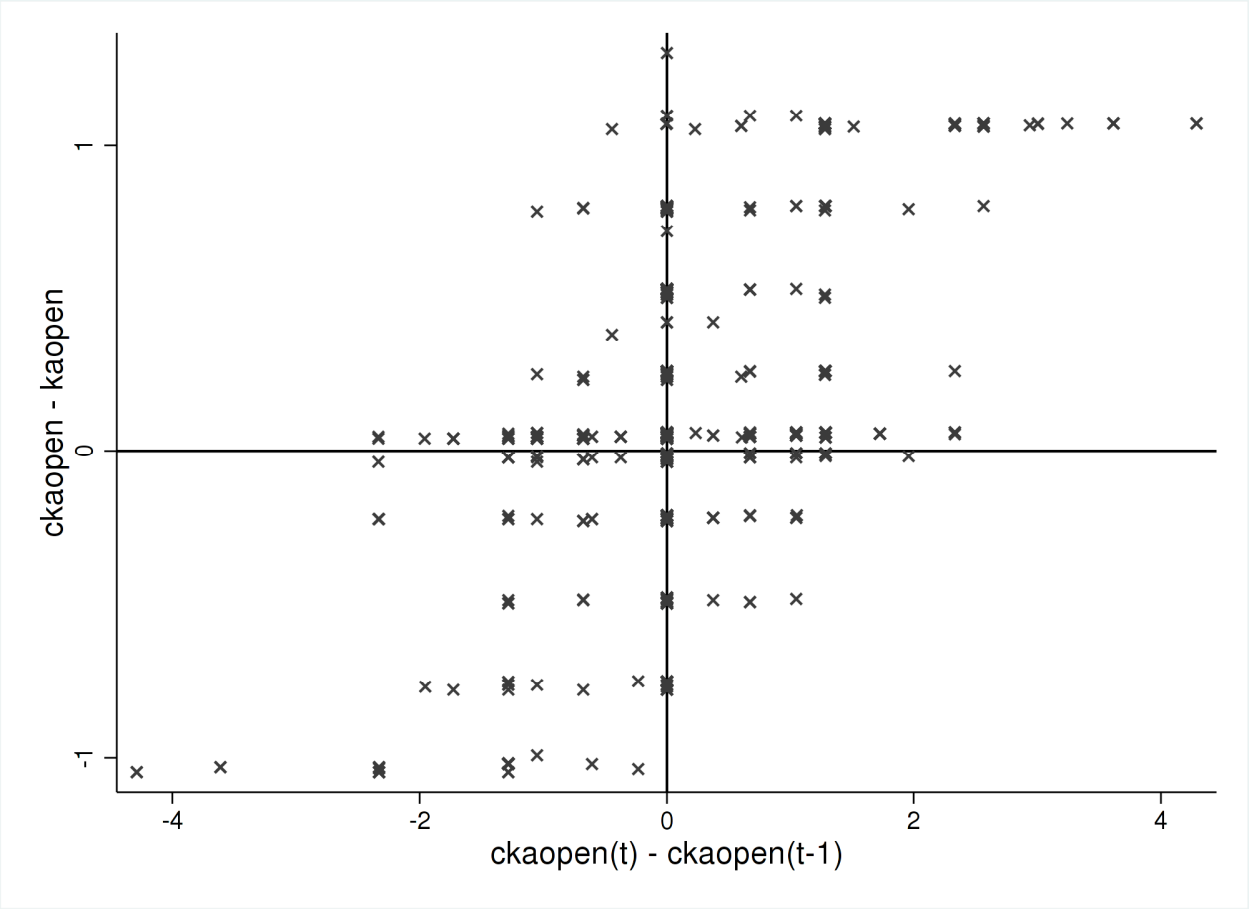

Figure 3: Percentage Change in Coefficients (Brooks and Kurtz)

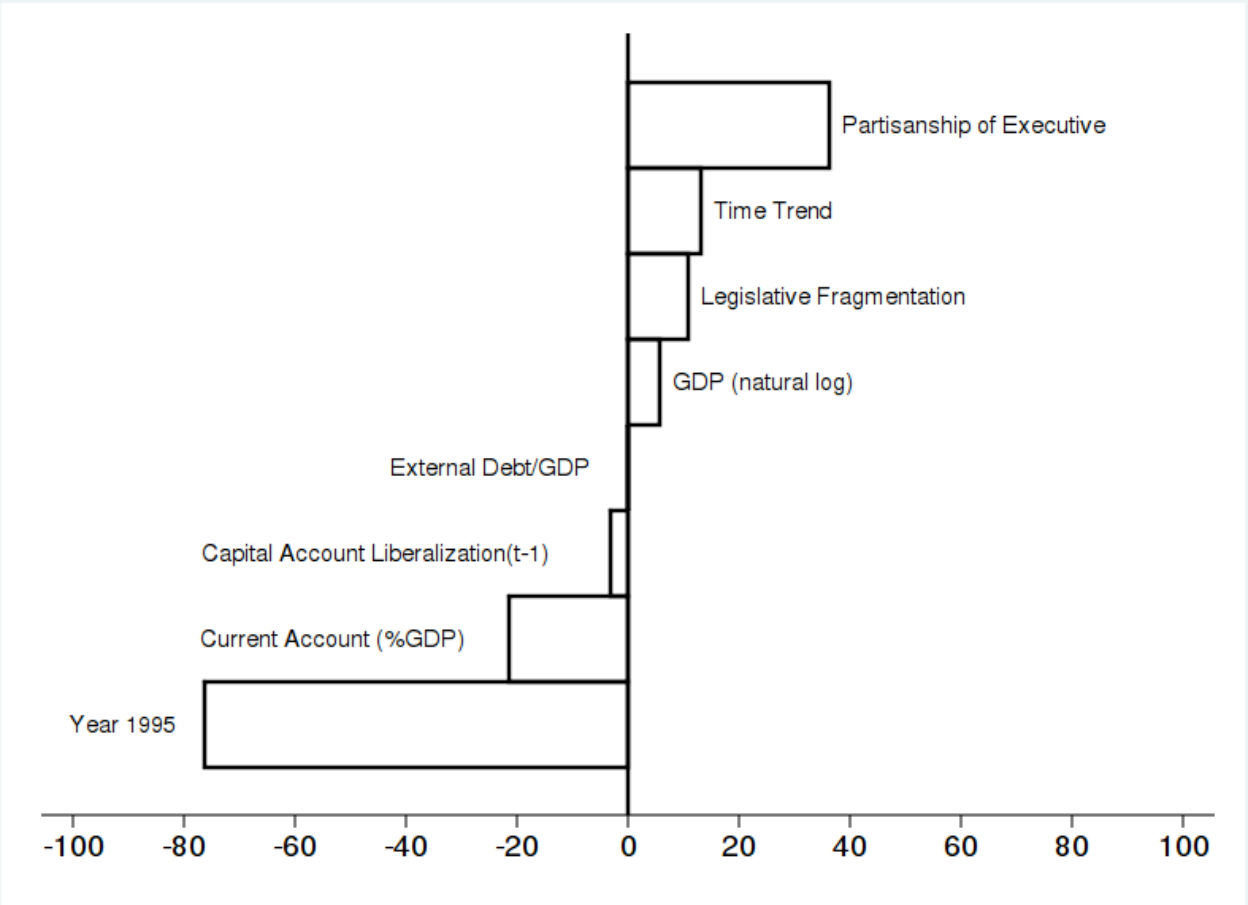

Figure 4: Percentage Change in Coefficients (Chwieroth)