Centre for Economic Policy Research

www.cepr.org

COMPETITION POLICY TRENDS AND ECONOMIC GROWTH: CROSS-NATIONAL EMPIRICAL EVIDENCE

Joseph A. Clougherty, WZB Berlin and CEPR

This Discussion Paper is issued under the auspices of the Centre's research programme in **INDUSTRIAL ORGANIZATION and INTERNATIONAL MACROECONOMICS**. Any opinions expressed here are those of the author(s) and not those of the Centre for Economic Policy Research. Research disseminated by CEPR may include views on policy, but the Centre itself takes no institutional policy positions.

The Centre for Economic Policy Research was established in 1983 as an educational charity, to promote independent analysis and public discussion of open economies and the relations among them. It is pluralist and non-partisan, bringing economic research to bear on the analysis of medium- and long-run policy questions.

These Discussion Papers often represent preliminary or incomplete work, circulated to encourage discussion and comment. Citation and use of such a paper should take account of its provisional character.

CEPR Discussion Paper No. 7515

October 2009

ABSTRACT

Competition Policy Trends and Economic Growth: Cross-National Empirical Evidence

Motivated by the general lack of empirical scholarship concerning the cross-national environment for competition policy, I present measures here of the overall resources dedicated to competition policy and the merger policy work-load for thirty-two antitrust jurisdictions over the 1992-2007 period. The data allow analysing a number of perceived trends in competition policy over the last two decades, and allow the generation of some factual insights concerning these trends: e.g., the budgetary commitment to competition policy in the cross-national environment for antitrust has substantially increased over this period; budgetary increases appear to be commensurate with increased antitrust workloads; yet, the role of economics does not appear to have substantially increased relative to the role of law. Moreover, I am also able to provide some evidence that budgetary commitments to antitrust institutions yield economic benefits in terms of improved economic growth: i.e., higher budgetary commitments to competition policy are associated with higher levels per-capita GDP growth.

Joseph A. Clougherty
WZB- Wissenschaftszentrum Berlin
Reichpietschufer 50
Berlin 10785
GERMANY

Email: clougherty@wzb.eu

Submitted 18 October 2009

1. Introduction

In most developed economies, the attention given to competition policy in the political agenda has increased substantially over the last two decades. While a number of antitrust jurisdictions exhibit long-standing commitments to antitrust principles (e.g., the US, Germany & the EU), other developed economies (particularly small economies that traditionally relied on trade policy to discipline markets) have recently introduced or substantially enhanced pre-existing competition policies (OECD, 2008; Boner and Krueger, 1991). Accordingly, we witness developments in support of these objectives: the introduction of new competition laws to formally change the institutional environment for antitrust enforcement (Palim, 1998); and the introduction of new competition authorities to enforce these laws (e.g., Portugal's PCA, and the Dutch NMa). In short, the last two decades appear to have experienced a number of substantial changes to the competition policies of many nations.

Despite observations of significant change across nations, we have surprisingly little quantitative empirical evidence on the state of competition policy in the cross-national context. A number of studies certainly attempt to survey the developments in cross-national competition policy (e.g., Boner and Krueger, 1991; Doern and Wilks, 1996; Röller, Stennek, and Verboven, 2000), but these studies rely exclusively on expert opinion and comparative case analysis.[1] Instead, the majority of quantitative empirical work on competition policy appears to be embedded in one antitrust jurisdiction – that nation often being the US.[2] The scarcity of hard empirical evidence is in part driven by the severe data limitations with regard to analyzing one nation's competition policy (Horn and Levinsohn, 2001)—such problems are of course compounded when one seeks to measure the competition policies in multiple nations.

Despite the stated difficulties, I aim to go beyond the case of a single antitrust jurisdiction and employ quantitative empirical evidence to analyze the cross-national environment for competition policy. In order to do so, I have compiled a unique data set that allows comparing experiences and trends across antitrust jurisdictions over the 1992-2007 period. While a number of inquiry areas come to mind when considering how economic analysis can contribute to an improved knowledge about the state of cross-national competition policy, the data more readily allow analysing two particular areas of interest: 1) the detection of broad trends in competition policy and practice over the period of study; 2) the impact of competition policy on economic growth. The first area of interest is motivated by the fact that a great deal of the received wisdom regarding competition policy has not been empirically tested: in short, there are far too many 'perceived' stylized facts out there. The second area of interest is guided by the perspective that competition policy can act as an intermediate input in to the economy: a facilitating device that promotes economic growth via the competitiveness of industry and firms.

The paper is organized as follows in order to support the analysis. Since the novelty of providing empirical evidence on the cross-national context for competition policy represents one of the defining features of this analysis, the next section describes the primary data in detail. The third section presents descriptive empirical analysis of trends in the cross-national

---

[1] Palim's (1998) empirical analysis of cross-national competition laws, the assessment by Dutz and Vagliasindi (2000) of the impact of transition nation's competition policy on firm mobility, and the consideration of how different commitments to competition policy impact TFP growth (Voigt, 2006, Buccirossi et al., 2009) represent exceptions to this point.

[2] Quantitative empirical work on US competition policy includes: Kwoka, 1999; Ghosal, 2002; Clougherty, 2005; Clougherty and Zhang, 2005. Quantitative empirical work on EU competition policy includes: Bergman, Jakobsson and Razo, 2003; Duso, Neven and Röller, 2007; Neven, Papandropoulos, and Seabright, 1998. Quantitative empirical work on German and Norwegian competition policy respectively includes: Lauk, 2002; and Nilssen, 1997.

environment for competition policy. The fourth section presents empirical analysis of how competition policy might impact economic growth. The fifth section concludes.

2. The Data

The actual data consist of annual measures of competition policy for 32 antitrust jurisdictions over the 1992-2007 period. The OECD directs members and associates to respond to specific questions in order to generate annual reports on the state of competition policy in those jurisdictions. Thus, the OECD's annual reports on 'Competition Policy in OECD Countries' provide raw data on cross-national competition policies that can be compiled into empirical measures. While the OECD reports are the main source of data for this study, additional data were gathered via direct contact with – and specific reports from – actual antitrust authorities in order to fill any data holes and reconcile any incompatibilities. The overriding concern in data compilation was to create consistently accurate measures of national competition policies. In doing so, the data are necessarily characterized as unbalanced panels—as a number of annual observations were missing or necessarily dropped in order to yield consistent cross-jurisdiction/cross-time measures.[3]

The actual empirical constructs concerning competition policy fall into two categories: overall resources and merger work-load. First, I have three measures concerning the resources which antitrust authorities can bring to bear in undertaking competition policies: 'Antitrust-Budget' refers to the yearly budget – measured in constant purchasing power parity (PPP) dollars – upon which the authority(s) can conduct competition policy. 'Economists' refers to the number of trained economists the authority(s) has in order to engage in competition policy analysis. 'Lawyers' refers to the number of trained lawyers the authority(s) has in order to engage in competition policy legal analysis and litigation.[4] Second, I have one measure concerning the merger policy work-load faced by antitrust authorities: 'Notified Transactions' refers to the annual number of transactions (mergers, acquisitions and alliances) that are notified in the antitrust jurisdiction. Unfortunately, I do not have data concerning the non-merger related workload (e.g., abuse-of-dominance and collusion cases) faced by antitrust authorities.

The above partially capture the resources and workload (at least with respect to merger policy) for the 32 different antitrust jurisdictions in the sample. Furthermore, I will match up the above data on competition policy with standard macroeconomic measures drawn from a variety of different sources (OECD's Factbook, World Bank's World Development Indicators, and others). Table 1 lists the main variables employed – along with their definitions and sources – for the analysis of competition policy trends, and the relationship between competition policy expenditures and economic growth.

*** put Table 1 near here ***

3. Trends in Cross-National Competition Policy

Before engaging in more structured analysis concerning competition policy and economic growth, it can be illustrative to have a look at basic trends in the resources used and the output generated by competition authorities in the cross-national context. The following questions concerning the 1992-2007 period for cross-national competition policy motivate this particular analysis: 1) how does growth in antitrust budgets compare to economic growth; 2) are the increases in antitrust budgets commensurate with enhanced antitrust workloads; 3) is the role of economics (economists) ascendant relative to law (lawyers) over the period of study?

---

[3] See Clougherty (2005) and Seldeslachts, Clougherty and Barros (2009) for papers that also employ OECD data while studying the cross-national context for competition policy.

[4] Note that 'Economists' and 'Lawyers' refers to the profession of the employee but not the training, thus we have no data, for example, on whether the Economists have attained a PhD or not.

Table 2 reports the mean growth rate for per-capita GDP, Antitrust Budget, Notified Transactions and the Economist/Lawyer ratio for all thirty-two jurisdictions in the data set. The comparison between column 1 (mean change in per-capita GDP measured in constant PPP terms) and column 2 (mean change in antitrust budgets measured in constant PPP terms) suggests that the monetary commitment of governments to competition policy has far outpaced economic growth in the sample. For all the observations in the data set, per capita GDP grew annually by 2.14 percent on average; yet, antitrust budgets grew annually by 18.05 percent on average. Only Argentina and Belgium exhibit lower growth in antitrust budgets as compared to per capita GDP growth. Clearly, political authorities have substantially increased their financial commitments to competition policy over the last decade. The comparison between column 2 (mean change in Antitrust-Budget measured in constant PPP terms) and column 3 (mean change in Notified-Transactions) allows gathering whether increased budgetary commitments to competition policy match any increases in antitrust workload. The evidence here suggests that increases in antitrust budgets have kept up with increases in notified transactions: with the number of notified transactions increasing by 15.04 percent on average, and antitrust budgets increasing by 18.05 percent on average for all observations over the period of study.

*** put Table 2 near here ***

Figure 1 presents illustrative evidence that corroborates that antitrust budgets have generally kept up with the increased pace of notified transactions in the sample of the cross-national environment for competition policy. The figure shows the yearly average change (1994-2007) for these two variables for all thirty-two jurisdictions, and indicates that any upsurge – or down surge – in merger activity (Notified-Transactions) is met by a corresponding change in antitrust budgets. That said, changes to antitrust budgets do appear to somewhat lag any changes to notified transactions; nevertheless, budgets ultimately do respond to changes in the merger wave.

*** put Figure 1 near here ***

The evidence above contradicts Kwoka's (1999) finding that US antitrust financial resources in the 1990s fell short of the antitrust needs during that period. This finding is line with the idea that the cross-national environment for competition policy exhibits a strengthening in policy – reflected in strong financial commitments – over the last few decades that out strips the marginal commitments to US antitrust policy. It should be pointed out, however, that cross-national antitrust authorities have other competition policy concerns (e.g., controlling collusion and anti-competitive behaviour) that will often be put on hold during merger waves in order to devote proper resources to vetting mergers. Accordingly, the commensurate budgetary increases might not even totally reflect the response by cross-national competition policies to the 1990s merger wave. While I lack measures of the non-merger actions taken by antitrust authorities that would help settle this issue, I do have another means to gather whether antitrust authorities became more stringent during the merger wave of the mid-to-late 1990s.

I know the annual number of merger policy actions (prohibitions, remedies and monitorings) in an antitrust jurisdiction for the 1993-2005 period. Accordingly, figure 2 presents illustrative evidence on the relationship between notified-transactions and merger-policy-actions by taking the average yearly percentage of notified mergers that elicit merger-policy actions for all observations—and for a sub-sample of observations. The sub-sample consists of five antitrust jurisdictions: Canada, European Union, Germany, United Kingdom and United States (referred to as the Big 5). These five jurisdictions all have relatively long standing commitments to competition policy; hence, the five jurisdictions act as a good robustness check to make sure any trends detected for All-Authorities are not driven strictly by the observations of less experienced authorities—authorities that may be embarking on new, or substantially beefed-up, competition policies. Figure 2 clearly illustrates that the

percentage of M&As eliciting merger policy actions actually increased over the period of study. Consider that the merger wave peaked in 2000; hence, merger policy appears to have gotten tougher both before and after the peak of the wave. Accordingly, this evidence suggests that cross-national antitrust jurisdictions were indeed able to properly vet the merger wave of the mid-to-late 1990s, and moreover were potentially engaging in increasingly stringent merger policy over the period of study.[5]

*** put Figure 2 near here ***

Another important trend that has been suggested to be present in recent years is the increased role of economic analysis in shaping competition policy and antitrust enforcement. Enhanced competition policy is in part the direct result of large-scale deregulation of many industries in the cross-national environment. As with regulatory policy – where economic ideas (and economists) were ascendant relative to legalistic ideas (see Derthick and Quirk, 1985; Winston, 1993) – the expectation would be for economic ideas, analysis and people to be ascendant in the realm of competition policy over the last decade relative to legal ideas, analysis and people. Although an imperfect indicator, I take the ratio of economists to lawyers working for an antitrust jurisdiction as a proxy for this effect. Figure 3 presents the ratio of economists to lawyers for All-Authorities and for the Big-5 authorities.[6] The figure illustrates that for the All-Authorities sample, the ratio of economists to lawyers first increased (in 1993 there were some .42 economists for every lawyer, but by 1998 there were .74 economists for every lawyer) and then decreased (by 2007 there were some .49 economists for every lawyer)—this does still, of course, represent a general increase from 1993 to 2007. The Big 5 ratio is far-more steady: hovering more consistently around a ratio of some .3 economists for every lawyer. Consequently, if the ratio of economists to lawyers accurately reflects the relative importance of economic ideas in competition policy; then, the role of economics has substantially increased over the 1993-1998 period – and decreased over the 1998-2007 period – in the less experienced antitrust jurisdictions, while it has remained stable in the more experienced antitrust jurisdictions.

*** put Figure 3 near here ***

In concluding, recall that three questions motivated the analysis here of trends in the cross-national environment for competition policy: 1) how does growth in antitrust budgets compare to economic growth; 2) are the increases in antitrust budgets commensurate with increases in antitrust workload; 3) is the role of economics (economists) ascendant relative to law (lawyers) over the period of study? I found evidence in support of the following over the 1992-2007 period: (1st) antitrust budgets have been growing much more robustly than the national economies in this sample; (2nd) antitrust budgets appear to have increased in line with the increased workload for antitrust authorities, and antitrust authorities appear to have been able to properly vet the merger wave of the 1990s; (3rd) the role of economics – at least as measured by the ratio of economists to lawyers – does not appear to be substantially increasing over this study period for experienced authorities, however less-experienced authorities indicate an upward trend in the role of economics followed by a downward trend.

---

[5] It should be pointed out that a number of authorities underwent changes to their merger notifications' procedures over this time period that generally increased merger notification thresholds. Accordingly, the upward trend witnessed in Figure 2 may actually be indicating that the merger authorities are simply better able to 'separate the wheat from the chaff' under the new threshold procedures. Unfortunately, virtually every authority incurred at least one change in notification threshold during the period of study, thus it does not make sense to sub-sample the data and report equivalent figures for both authorities with and without threshold changes. The same applies for Figure 1.

[6] The yearly ratio of economists to lawyers was created not by taking the average of the cross-national ratios, but instead by summing up all the economists and all the lawyers working for all authorities (or the Big 5 authorities) and then taking the ratio of that sum. Accordingly, the reported ratios are weighted by the various antitrust jurisdictions' staff sizes.

4. Competition Policy & Growth

Following the above analysis of trends in competition policy, the most natural question is what economic benefits nations receive with respect to investing in competition policy. For instance, the influence of a variety of public policies (e.g., monetary, fiscal, labour, regulatory, and trade) on economic growth has been a question of particular interest for both economic researchers and government officials. Ahn and Hemmings (2000) provide an excellent review of the vast literature on the policy determinants of economic growth, and observe that "the efficiency of markets for goods and services and the incentives for innovation created by competition policy and other regulatory frameworks potentially have an important influence on growth" (p. 44). Consider also the theoretical work – e.g., Porter (1990), and Aghion, Dewatripont and Rey (1999) – that sets conditions for when domestic competition can enhance the effort of firms and thereby enhance economic growth. In line with the proposition that intense competition breeds growth, the relationship between international trade openness and economic growth has been widely investigated for empirical regularities (Ahn and Hemmings, 2000). Further, the relationship between regulatory policy and economic growth has received increased interest by empiricists (e.g., Nicoletti and Scarpetta, 2003).

Surprisingly, however, very little literature exists concerning the impact of competition policy on economy-wide growth. In fact, Dutz and Hayri (1999) represents the only study I was able to identify concerning competition policy and economic growth; though, Voigt (2006) and Buccirossi et al. (2009) consider the impact of competition policy on TFP growth. Further, Nicoletti and Scarpetta (2003) find antitrust exemptions for public enterprises and product market regulation to negatively effect growth; yet, regulatory – not competition – policy is the focus of their work. While Dutz and Hayri find evidence in support of better domestic competition policy leading to increased economic growth, they base their findings on survey data found in the 1996 'World Competitiveness Report': where a question was asked concerning the respondents 'perception that antitrust is effectively promoting competition'. This measure of national competition policy does not vary over time; thus, any captured beneficial effects are strictly driven by between-nation (not within-nation) variation. Further, Voigt (2006) critiques this approach and shows that competition-policy effects are not robust to including a measure of the general quality of national institutions. My aim here is too add to this literature by testing whether a less-subjective measure of competition policy that varies over time (national government expenditures on competition policy) contributes to economy-wide growth while controlling for the general effectiveness of national institutions.

Levine and Renelt (1992) note that no consensus exists vis-à-vis a theoretical framework to guide empirical work on growth; hence, no complete specification exists concerning what variables "should be held constant while conducting statistical inference on the relationship between growth and the variables of primary interest" (p. 943). Nevertheless, a few studies over the last decade have observed that some core explanatory variables regarding growth models are manifest in the literature. Dutz and Hayri (1999) identify four core constructs: a convergence effect; a trade-openness effect; a human-capital effect; and a physical-capital-investment effect. Ahn and Hemmings (2000) identify the same four constructs, and also identify population growth and inflation as core constructs. In fact, even Levine and Renelt (1992) cite the above six constructs as standard control variables in the literature—these six variables constitute two-thirds of the constructs they use in their influential extreme-bounds analysis (EBA) of economic-growth drivers.[7] In keeping with the above literature and in order to make inferences on the relationship between competition

---

[7] The additional three constructs utilized by Levine and Renelt (1992) include: government consumption expenditures, the growth rate of domestic credit, and an index for the number of revolutions and coups.

policy and economic growth, I compile measures to capture the effects of these six standard constructs:

First, it is imperative to control for previous levels of GDP (the convergence effect noted above), as relatively poor nations are expected to experience greater growth than relatively rich nations: i.e., it is no surprise that the growth rates in China currently outflank those in developed nations. Accordingly, the lagged per capita GDP level in constant PPP terms (hereafter referred to as Per-Capita-GDP) controls for prior levels of economic development—what is sometimes referred to as the 'initial condition effect'.

Second, studies support a relationship between investment in physical capital and economic growth. Akin to the majority of empirical growth studies, I use the percentage of gross capital formation relative to GDP (hereafter referred to as Physical-Capital) in order to measure the impact of new capital expenditures on GDP growth.

Third, human capital accumulation has also been found to have an important impact on economic growth. Despite general agreement on the importance of factoring human capital formation in the growth process, the data quality on this construct is particularly bad (see De la Fuente and Domenech's (2006) addressing of this issue). While Dutz and Hayri (1999) use life-expectancy to proxy human capital, Ahn and Hemmings (2000) note that schooling-levels have also been used in order to tease out cross-country human capital differences. Accordingly, I employ the percentage of the national population between 25 and 64 attaining a tertiary – i.e., higher – education level to proxy for human capital (hereafter referred to as Human-Capital), but are mindful of its deficiencies.

Fourth, a substantial amount of literature suggests—as previously noted—that trade-openness fundamentally affects economic growth (e.g., Hoeller, Girouard and Colecchia, 1998; Ahn and Hemmings, 2000). Accordingly, I include exports as a percentage of GDP (hereafter Openness) to measure the impact of a nation being open to the world trade system.

Fifth, population growth has also been found to negatively impact growth rates. The negative relationship between population and economic growth reflects a number of mechanisms: the strongest evidence suggesting that population growth involves an increasing dependency ratio that dampens growth in GDP per capita. Accordingly, I include the annual rate of population growth (hereafter Population-Growth) to capture this effect.

Sixth, the inflation rate for the economy is also included as a control variable, as high inflation has been generally found to be damaging for long-run economic growth. National macroeconomic policies often attempt to reduce inflation due to a variety of perceived benefits from such actions: 1) ensuring that the damaging effects of hyper-inflation are not experienced: 2) mitigating the uncertainty that comes with inflation; 3) minimizing any relative price distortions in the domestic market; 4) enhancing the credibility of monetary policy (Ahn and Hemmings, 2000). Accordingly, the annual inflation rate for a national economy (hereafter Inflation) is controlled for.

As already alluded to above, I must control for an additional construct: the general effectiveness of a nation's political institutions. Voigt (2006) points out that there is a high correlation between government effectiveness indicators and measures of competition policy. Accordingly, measures of competition policy may actually be reflecting institutional quality factors instead of more focused government efforts regarding competition policy. Thus, it behoves one to include – akin to Voigt (2006) – Kaufmann et al.'s (2008) measure of the general quality of a nation's institutions (hereafter Government-Effectiveness) in order to elicit more robust inferences on the impact of antitrust budgets on growth.

4.1. *Estimation Issues*

The discussion above identified the six core explanatory constructs found in the economic growth literature, the additional government effectiveness issue per Voigt (2006), and the measures I was able to gather in order to capture those effects. It is also important to

identify the two constructs of primary interest here: i.e., the relationship between economic-growth and competition-policy. The standard dependent variable for empirical work on growth is the percentage change in real per-capita GDP. Hence, I adopt the yearly percent change in real per-capita GDP measured in PPP terms as the dependent variable (hereafter referred to as Growth). The explanatory variable of principal interest is a nation's commitment to competition policy. As already noted, I use the annual budgetary resources – measured in PPP terms – devoted to competition policy, as a measure of the commitment to competition policy (referred to as Antitrust-Budget).

The actual data employed for the estimated growth model consist—at the most detailed level of abstraction—of annual measures for twenty-five national antitrust jurisdictions over the 1996-2007 period.[8] Properly analyzing the data, however, requires the consideration of a few econometric issues: level-of-analysis for observations; choice between fixed and random effects; and the appropriateness of period effects.

First, the custom for empirical work on economic growth is to average growth over a ten to twenty year period in order to smooth out any business cycle effects and then estimate cross-sectional (i.e., cross-national) models. In that vein, Fölster and Henrekson (1999) note that "estimating relationships using annual data can be dominated by mistiming and thus by measurement error" (p. 349). Nevertheless, Fölster and Henrekson also argue that growth estimations must move beyond cross-sectional methods for a couple of reasons: first, to reduce the simultaneity bias that is rife in cross-national regressions where both left and right hand-side variables are averaged over a long period; second, to take advantage of potential within-country variation. Recall that Table 2 suggests a great deal of variation in terms of national commitments to competition policy over the 1992-2007 period. With these same rationales as a backdrop, Bassanini, Scarpetta and Hemmings (2001), and Hoeller, Girouard and Colecchia (1998) all argue for and employ panel-data methods in their empirical work on growth. When adopting a yearly level-of-analysis, however, it becomes imperative to control for both the annual inflation rate – already noted above as a control variable – and the annual unemployment rate in the labour force (hereafter referred to as Unemployment). In short, macroeconomic variables, e.g., inflation and unemployment, must be included as control variables in order to partially capture the business cycle and mitigate mistiming and measurement-error problems.

Second, estimating panel data regression models often implies a choice between a fixed-effects specification and a random-effects specification. The relatively small degrees-of-freedom (only 42 observations for the panel treatments with five-year averages) available favours the adoption of random effects. Greene (1990) points out that fixed-effects involve a large loss of degrees-of-freedom; thus, yielding practical merits for the choice of random-effects when observations are limited. Nevertheless, diagnostics – F test for No Fixed Effects and Hausman Test for Random Effects – suggest the appropriateness of the fixed-effects method. In addition, fixed-effects is the more conservative route when data are characterized as unbalanced panels.

Third, a number of potential changes have occurred in the cross-national environment for antitrust and economic growth over the 1992-2007 period—changes that create time-specific data trends, affect inferences, and call for the addition of period-effects. For example, the addition of period effects helps control for macroeconomic trends that affect yearly

---

[8] The EU and six of the national antitrust jurisdictions from Table 2 (Austria, Argentina, Belgium, Brazil, Italy, and Portugal) were dropped from this analysis as they had more than seven observations missing for the variable of key interest. Further, the data on government effectiveness only extends from 1996-2007; hence, the regressions based on annual observations span the 1996-2007 period and do not include observations on years prior to 1996. Since Voigt's (2006) work is so clear on this point, including the Government-Effectiveness variable appears to be worth the sacrifice in observation numbers.

growth in all nations; thus, partially addressing the concerns noted above vis-à-vis business cycles.

The six reported regression equations in Table 3 take the above econometric concerns into account. The first three regressions use the full variation involved with annual observations by keeping the unit of analysis at the country-year. The second three regressions take five-year averages of the various constructs for each country – in keeping with the growth literature (e.g., Kneller, Bleaney and Gemmell, 1999; Fölster and Henrekson, 2001) – thus the temporal unit of analysis consists of three periods: averages for 1993-1997, 1998-2002, and 2003-2007.[9] Furthermore, I report a basic OLS specification, a random-effects specification, and a fixed-effects specification – with the OLS and random-effects specifications representing good robustness checks for the fixed-effects results. Furthermore, a fixed period-specific effect is included in all six regressions.

Since the fixed-effects specification is both econometrically-conservative and readily-expressible, it is represented here:

$$\text{Growth}_{it} = b_0 + b_1\,(\text{Antitrust-Budget})_{it-1} + b_2\,(\text{Per-Capita-GDP})_{it-1} +$$

$$b_3\,(\text{Physical-Capital})_{it} + b_4\,(\text{Human-Capital})_{it} + b_5\,(\text{Openness})_{it-1} +$$

$$b_6\,(\text{Population-Growth})_{it} + b_7\,(\text{Inflation})_{it} + b_8\,(\text{Unemployment})_{it} +$$

$$b_9\,(\text{Government-Effectiveness})_{it} + \varepsilon_{it} + \alpha_i + \gamma_t$$

where i indexes the twenty-five national antitrust jurisdictions, t indexes time (annual or 5-year averages), α_i represents the fixed panel specific effect, and γ_t captures the fixed period specific effect.

4.2. *Empirical Results*

As already mentioned, Table 3 reports the estimation results for the six regression models. It is important that the regression models be reasonably well-specified and behave in accordance with prior theory and empirical work in order to be reasonably confident regarding inferences concerning the competition-policy/economic-growth relationship. While the models appear to yield results that are generally consistent with expectations, the following analysis takes a variable-by-variable approach to ensure that the control variables conform with both prediction and previous empirical growth work.

- The coefficient estimate for Per-Capita-GDP (the convergence effect) is negative and statistically significant in five of the six regression models. This conforms to expectation and with the economic growth literature: nations with higher levels of income generally grow slower than do nations with lower levels of income.
- The coefficient estimate for Physical-Capital is positive and significant as expected in the first three regression models (where annual data is employed); though, insignificant in the last three regression models (where 5-year average data is employed). Accordingly, the estimations yield some evidence in support of the prediction that investments in physical-capital generate positive economic growth.
- The coefficient estimate for Human-Capital is insignificant in all the regression models except for #6—and there it is negative. The lack of conformance with prediction may owe to the deficiencies of the proxy used for Human-Capital: tertiary education attainment. It stands to reason that this measure will not vary considerably

---

[9] If a couple of annual observations are missing within the five-year average, I compute the average based on the available observations in order to preserve degrees of freedom.

for a nation over a fifteen year period; thus, its' poor performance does make intuitive sense.

- The coefficient estimate for Openness is positive and significant as expected in all six regression models: the positive impact of Openness on Growth appears to be the most statistically robust control effect in the estimation treatments.
- The coefficient estimate for Population-Growth is insignificant in all six regression models. Accordingly, the estimations yield little evidence in support of the prediction that population growth leads to negative economic growth.
- The coefficient estimates for Inflation are negative and significant in the first five regression models, thus conforming to prediction that inflation reduces economic growth.
- The coefficient estimates for Unemployment are insignificant in all of the regression models.
- Finally, the coefficient-estimates for Government-Effectiveness are positive and significant in regression models' #2, #3 & #6; thus, lending some support to the literature on general institutional quality setting the conditions for economic growth.

In sum the eight control variables do not perform perfectly, but they are reasonably consistent with *a priori* expectations and the existing empirical literature on economic growth. Accordingly, we should infer a degree of confidence that the regression models are relatively well specified and thus allow inferences regarding the relationship of primary concern: competition-policy and economic-growth. Turning now to the explanatory variable of principal concern, the coefficient estimates for Antitrust-Budget is positive and significant in all six regression models. Accordingly, the estimations yield evidence in support of the prediction that commitments to competition policy correlate with positive economic growth.

As already noted, Regression #3 (the fixed-effects estimation with annual observations) could be considered the more econometrically conservative estimation technique; hence, further interpreting that coefficient estimate (14.31) for economic significance involves merit. The coefficient estimate suggests that an increase to the mean level of competition policy funding in the sample by one standard-deviation ($58.8 million) would result in increased economic growth by 0.84 percentage points on average. Furthermore, the UK's growing commitment of resources to competition policy (a $23 million difference between its lowest level in 1998 and maximum level in 2005) suggests that the UK would experience increased yearly economic growth of some 0.33 percentage points on average due to its increased commitment of budgetary resources to competition policy. I can also do some cross-country comparisons to illustrate the potential impact of different national commitments to competition policy. For instance, the UK's relatively strong commitment of resources to competition policy ($18 million on average for our sample) compared with France's relatively weak commitment of resources to competition policy ($8.3 million on average) suggests that British economic growth – holding other things constant – would be some 0.14 percentage points higher than that in France due to its higher commitment to competition policy.

5. Conclusion

I have compiled a unique cross-national data set on the state of national competition policies for the 1992-2007 period. While a number of pundits make observations on the cross-national environment for competition policy, few studies bring empirical evidence to bear on this issue. The broad scope of the data allows consideration of a number of important questions regarding the state of competition-policy in the cross-national environment: 1) can we detect any broad trends in competition policy and practice over the last two decades; 2) is

there a relationship between national commitments to competition policy and economy-wide growth? The empirical results suggest the following:

First, in terms of important trends in cross-national competition policy: it appears that political authorities have been dedicating larger levels of resources to antitrust authorities over the last two decades. Antitrust budgets have grown substantially, and the budgets appear to be increasing in line with the increased workload for antitrust authorities (particularly with the unprecedented merger-wave of the mid-to-late 1990s). Furthermore, the percentage of mergers eliciting merger-policy actions actually increased consistently over the 1993-2005 period. However, there appears to be no evidence that the role of economics is ascendant relative to the role of law – as measured by the ratio of economists to lawyers – over the 1993-2007 period. It should be pointed out, however, that there is some evidence with respect to an increased role for economics (economists) being manifest in less experienced antitrust jurisdictions.

Second, in terms of competition-policy being an important factor in what drives overall economic growth in a national economy: I found supportive evidence that competition policy (or at least a nation's budgetary commitment to competition policy) plays a positive role in economic growth. The empirical tests here are not definitive, but they do suggest that competition policy is yet another public policy that could have some explanatory power when it comes to defining the source of economic wealth.

References

Aghion, Philippe, Dewatripont, Mathias and Rey, Patrick (1999) Competition, financial discipline and growth, *Review of Economic Studies*, 66, pp. 825-852.

Ahn, Sanghoon and Hemmings, Philip (2000) Policy influences on economic growth in OECD countries: An evaluation of the evidence, OECD Economics Department Working Paper No. 246.

Bassanini, Andrea, Scarpetta, Stefano and Hemmings, Philip (2001) Economic growth: The role of politics and institutions. Panel data evidence from OECD countries, OECD Economics Department Working Paper No. 283.

Bergman, Mats A., Jakobsson, Maria and Razo, Carlos (2003) An econometric analysis of the European Commission's merger decisions, mimeo, Stockholm and Uppsala University.

Boner, Roger A. and Krueger, Reinald (1991) The basics of antitrust policy: A review of ten nations and the European communities, World Bank Technical Papers, No. 160.

Buccirossi, Paolo, Ciari, Lorenzo, Duso, Tomaso, Spagnolo, Giancarlo and Vitale, Cristiana (2009) Competition Policy and Productivity Growth: An Empirical Assessment, mimeo, WZB-Berlin.

Clougherty, Joseph A. (2005) Industry trade-balance and domestic merger policy: empirical evidence from U.S. merger policy for manufacturing sectors, *Contemporary Economic Policy*, 23(3), pp. 404-415.

Clougherty, Joseph A. and Zhang, Anming (2005) Export orientation and domestic merger policy: Theory and some empirical evidence, *Canadian Journal of Economics*, 38(3), pp. 778-806.

Doern, G. Bruce and Wilks, Stephen (1996) *Comparative Competition Policy: National Institutions in a Global Market* (New York: Clarendon Press).

De la Fuente, Angel and Domenech, Rafael (2006) Human capital in growth regressions: how much difference does data quality make?, *Journal of the European Economic Association*, 4(1), pp. 1-36.

Derthick, Martha and Quirk, Paul (1985) *The Politics of Deregulation* (Washington DC: The Brookings Institution).

Duso, Tomaso, Neven, Damien J. and Röller, Lars-Hendrik (2007) The political economy of European merger control: Evidence using stock market data, *Journal of Law and Economics*, 50(3), pp. 455-489.

Dutz, Mark A. and Hayri, Aydin (1999) Does more intense competition lead to higher growth?, World Bank Policy Research Working Paper No. 2320.

Dutz, Mark A. and Vagliasindi, Maria (2000) Competition policy implementation in transition economies: An empirical assessment, *European Economic Review*, 44, pp. 762-772.

Fölster, Stefan and Henrekson, Magnus (1999) Growth and the public sector: A critique of the critics, *European Journal of Political Economy*, 15, pp. 337-358.

Fölster, Stefan and Henrekson, Magnus (2001) Growth effects of government expenditure and taxation in rich countries, *European Economic Review*, 45(8), pp. 1501-1520.

Ghosal, Vivek (2002) Potential foreign competition in U.S. manufacturing, *International Journal of Industrial Organization*, 20, pp. 1461-1489.

Greene, William H. (1990) *Econometric Analysis* (New York: Macmillan).

Hoeller, Peter, Girouard, Nathalie and Colecchia, Alessandra (1998) The European Union's trade policies and their economic effects, OECD Economics Department Working Paper No. 194.

Horn, Henrik and Levinsohn, James (2001) Merger policies and trade liberalization, *The Economic Journal*, 111, pp. 244-276.

Kaufmann, Daniel, Kraay, Aart and Mastruzzi, Massimo (2008) Governance Matters VII: Governance Indicators for 1996-2007, World Bank Policy Research Working Paper No. 4280.

Kneller, Richard, Bleaney, Michael F. and Gemmell, Norman (2001) Fiscal policy and growth: evidence from OECD countries, *Journal of Public Economics*, 74, pp. 171-190.

Kwoka Jr., John E. (1999) Commitment to competition: An assessment of antitrust agency budgets since 1970, *Review of Industrial Organization,* 14, pp. 295-302.

Lauk, Martina (2002) Econometric analysis of the decisions of the German Cartel Office, Working Paper, TU Darmstadt.

Levine, Ross and Renelt, David (1992) A sensitivity analysis of cross-country growth regressions, *American Economic Review*, 82(4), pp. 942-963.

Neven, Damien J., Papandropoulos, Pénélope and Seabright, Paul (1998) *Trawling for Minnows: European Competition Policy & Agreements Between Firms* (London: Centre for Economic Policy Research).

Nicoletti, Giuseppe and Scarpetta, Stefano (2003) Regulation, productivity and growth: OECD evidence, *Economic Policy*, April, pp. 9-72.

Nilssen, Tore (1997) On the consistency of merger policy, *Journal of Industrial Economics*, 45, pp. 89-100.

OECD (2008) Competition policy in OECD countries (Paris: OECD).

Palim, Mark R.A. (1998) The worldwide growth of competition laws: an empirical analysis, *The Antitrust Bulletin*, Spring, pp. 105-145.

Porter, Michael E. (1990) *The Competitive Advantage of Nations* (New York: The Free Press).

Röller, Lars-Hendrik, Stennek, Johan and Verboven, Frank (2000) Efficiency gains from mergers, WZB Discussion Paper No. FS IV 00-09.

Seldeslachts, Jo, Clougherty, Joseph A. and Barros, Pedro (2009) Settle for now but block for tomorrow: The deterrence effects of merger policy tools, *Journal of Law and Economics*, 52, forthcoming.

Voigt, Stefan (2006) The economic effects of competition policy: Cross-country evidence using four new indicators, International Centre for Economic Research Working Paper No. 20/2006.

Winston, Clifford (1993) Economic deregulation: Days of reckoning for microeconomists, *Journal of Economic Literature*, 31(3), pp. 1263-1289.

Table 1: Variables, Sources and Definitions

Variable	Source	Definition
Growth	World Bank's WDI	GDP per capita growth as an annual percentage change
Antitrust-Budget	OECD (2008)	Total Antitrust Budget in PPP terms in international USD
Per-Capita GDP	World Bank's WDI	GDP per capita in PPP terms in constant 2005 international USD
Physical-Capital	World Bank's WDI	Gross capital formation as a Share of GDP
Openness	World Bank's WDI	Exports of goods and services as a share of GDP
Human-Capital	OECD Factbook	Tertiary attainment for age group 25- 64 as a share of the population of that age group
Population-Growth	World Bank's WDI	Annual growth of the population
Inflation	World Bank's WDI	Annual Inflation rate
Unemployment	World Bank's WDI	Unemployment as a share of the total labour force.
Government-Effectiveness	Kaufmann, Kraay and Mastruzzi (2008)	Indicator (ranging from -2.5 to 2.5) measuring perceptions of the quality of public services, quality and independence of the civil service, quality of policy formulation and implementation, and credibility of the government's commitment to such policies.
Notified-Transactions	OECD (2008)	Number of mergers, acquisitions and alliances notified to the antitrust authorities.
Economists-Lawyer Ratio	OECD (2008)	Ratio of economists to lawyers in the antitrust authorities; i.e., (# Economists / # Lawyers).

Table 2: Means for Percentage Change in Per-Capita GDP, Antitrust Budget, Notified Transactions and Economists- Lawyer Ratio

	Per Capita GDP	Antitrust Budget	Notified Transactions	Economists-Lawyer Ratio
Argentina	3.27	1.03	33.41	28.86
	(17)	(4)	(2)	(3)
Australia	1.99	20.82	14.17	0.49
	(17)	(14)	(14)	(3)
Austria	1.87	53.66	-1.34	27.7
	(17)	(5)	(10)	(6)
Belgium	1.68	0.66	4.9	-0.86
	(17)	(6)	(12)	(9)
Brazil	1.38	2.5	71.03	-21.87
	(17)	(6)	(12)	(4)
Canada	1.77	6.94	4.69	-4.29
	(17)	(14)	(15)	(14)
Czech Republic	2.11	19.17	24.87	-3.87
	(17)	(14)	(13)	(14)
Denmark	1.88	6.62	-13.09	-5.5
	(17)	(14)	(5)	(12)
EU	1.62	9.19	15.78	4.2
	(17)	(7)	(13)	(4)
Finland	2.14	6.2	-3.47	2.04
	(17)	(10)	(8)	(9)
France	1.41	37.13	-12.17	.
	(17)	(8)	(7)	(0)
Germany	1.52	4.21	3.58	-0.91
	(17)	(14)	(15)	(14)
Greece	2.57	83.3	23.75	34.54
	(17)	(7)	(7)	(4)
Hungary	2.28	55.71	16.77	-2.45
	(17)	(12)	(10)	(12)
Ireland	5.1	21.92	14.97	10.73
	(17)	(9)	(11)	(12)
Italy	1.11	.	8.59	0
	(17)	(0)	(13)	(1)
Japan	1.19	4.61	-7.79	.
	(17)	(15)	(14)	(0)
Mexico	1.68	13.93	4.02	7.07
	(17)	(9)	(9)	(9)
Netherlands	2.06	22.14	0.88	-14.03
	(17)	(9)	(9)	(2)
New Zealand	1.87	8.41	-8.39	30.37
	(17)	(8)	(10)	(8)
Norway	2.57	3.62	7.79	-4.91
	(17)	(13)	(10)	(11)
Poland	3.95	18.08	44.89	-1.88
	(17)	(9)	(10)	(10)
Portugal	1.73	27.21	14.2	-18.52
	(17)	(6)	(10)	(6)
Russia	0.86	54.13	511.57	.
	(17)	(7)	(2)	(0)
S. Korea	4.82	17.4	16.78	-5.97
	(17)	(14)	(14)	(10)
Slovakia	2.82	15.34	29.18	8.85
	(17)	(10)	(15)	(10)
Spain	2.19	12.88	18.81	0.92
	(17)	(5)	(12)	(4)
Sweden	1.96	3.47	-7.54	-4.17
	(17)	(14)	(10)	(10)
Switzerland	0.69	9.1	32.32	-1.89
	(17)	(11)	(8)	(8)
Turkey	2.59	76.98	18.04	6.51
	(17)	(7)	(8)	(3)
United Kingdom	2.13	9.95	-3.95	1.22
	(17)	(11)	(13)	(10)
United States	1.78	6.49	5.19	0.07
	(17)	(15)	(14)	(14)
SUM	**2.14**	**18.05**	**15.04**	**1.45**
	(544)	**(307)**	**(335)**	**(236)**

() = # observations

Table 3: Regression Results for Growth Equations

Variables	Annual Data			5-Year-Average Data		
Regression Model:	#1	#2	#3	#4	#5	#6
	OLS	Random Effects	Fixed Effects	OLS	Random Effects	Fixed Effects
Antitrust-Budget$_{t-1}$ (in billions)	8.152*** (2.728)	14.02*** (4.082)	14.31* (7.598)	10.59** (4.489)	15.36** (6.482)	20.62** (8.924)
Per-Capita-GDP$_{t-1}$ (in thousands)	-0.108*** (0.0295)	-0.224*** (0.0448)	-0.825*** (0.262)	-0.134*** (0.0414)	-0.175*** (0.0663)	-0.228 (0.140)
Physical-Capital$_t$	0.0794** (0.0393)	0.147* (0.0764)	0.472*** (0.147)	-0.0321 (0.0650)	-0.0644 (0.0708)	0.119 (0.249)
Openness$_t$	0.0338*** (0.00782)	0.0407** (0.0164)	0.171** (0.0764)	0.0266** (0.0122)	0.0285** (0.0135)	0.112* (0.0616)
Human-Capital$_{t-i}$	-0.00390 (0.0281)	-0.0173 (0.0428)	0.0477 (0.118)	-0.0241 (0.0426)	-0.0638 (0.0487)	-0.401*** (0.130)
Population-Growth$_t$	0.0799 (0.261)	-0.193 (0.400)	-0.235 (0.673)	0.0179 (0.384)	0.146 (0.400)	-0.0405 (0.868)
Inflation$_{t-1}$	-0.0441** (0.0179)	-0.0653* (0.0385)	-0.0750*** (0.0253)	-0.0433** (0.0201)	-0.0643*** (0.0215)	-0.0448 (0.0622)
Unemployment$_t$	0.0538 (0.0405)	-0.0234 (0.0637)	-0.139 (0.115)	0.0841 (0.0586)	0.0642 (0.0864)	0.218 (0.252)
Government-Effectiveness$_t$	0.700 (0.450)	2.116** (0.954)	2.257** (1.060)	0.535 (0.627)	1.044 (0.743)	5.598*** (1.230)
Observations	242	242	242	42	42	42
R^2	0.350		0.522	0.616		0.924

*denotes $p<0.1$, ** $p<0.05$, *** $p<0.01$; standard errors are in parentheses; robust standard errors employed for random and fixed effects

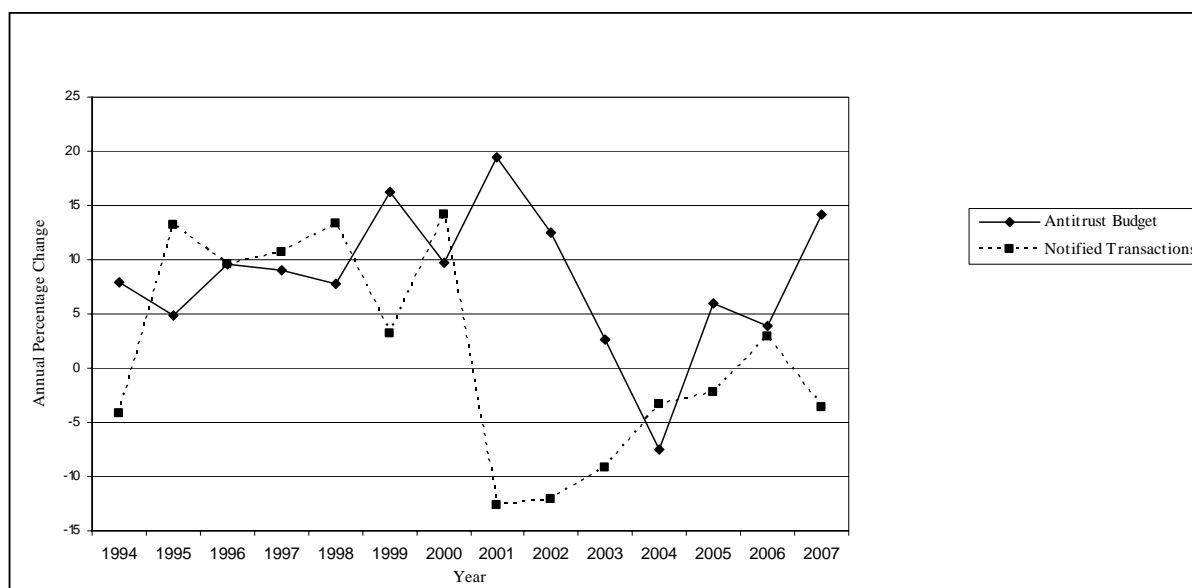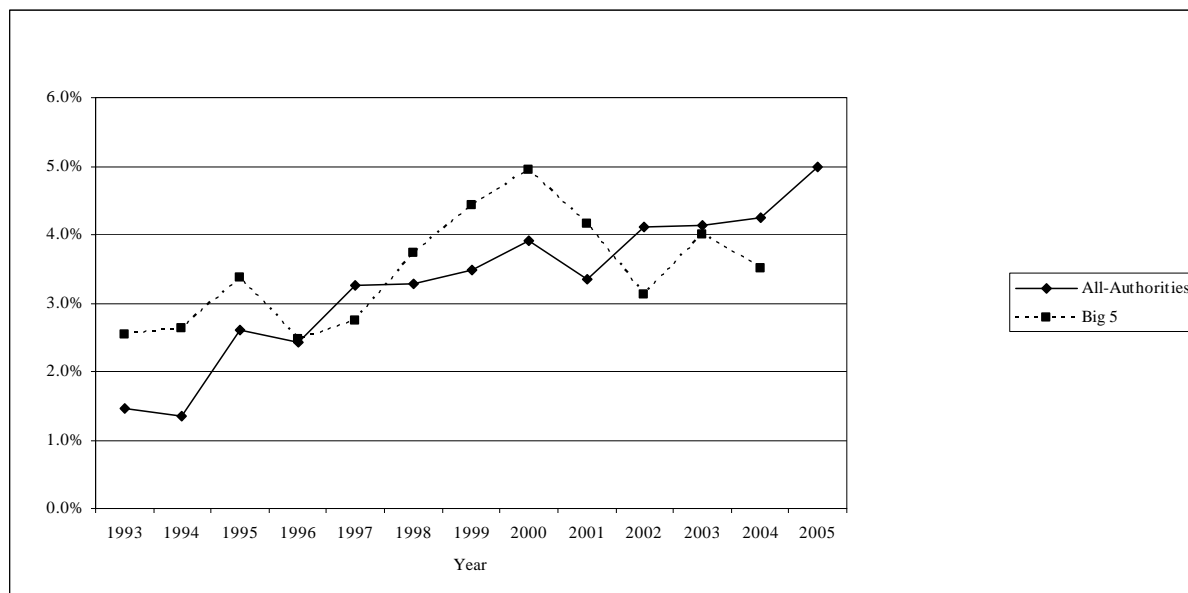**Figure 1:** Mean Change in Antitrust-Budget & Notified-Transactions by Year for All Authorities

Figure 2: Annual Percentage of Notified-Transactions Eliciting Merger Policy Actions

Figure 3: Annual Ratio of Economists to Lawyers