February 2007
IMF Country Report No. 07/82

Republic of Croatia: Selected Issues

This Selected Issues paper for the Republic of Croatia was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on January 30, 2007. The views expressed in this document are those of the staff team and do not necessarily reflect the views of the government of the Republic of Croatia or the Executive Board of the IMF.

The policy of publication of staff reports and other documents by the IMF allows for the deletion of market-sensitive information.

To assist the IMF in evaluating the publication policy, reader comments are invited and may be sent by e-mail to publicationpolicy@imf.org.

Copies of this report are available to the public from

International Monetary Fund ● Publication Services
700 19th Street, N.W. ● Washington, D.C. 20431
Telephone: (202) 623 7430 ● Telefax: (202) 623 7201
E-mail: publications@imf.org ● Internet: http://www.imf.org

Price: $18.00 a copy

International Monetary Fund
Washington, D.C.

INTERNATIONAL MONETARY FUND

REPUBLIC OF CROATIA

Selected Issues

Prepared by the Staff Representatives for the
2006 Consultation with the Republic of Croatia

Approved by European Department

January 30, 2007

Contents Page

Contents Page

Contents Page

Contents Page

I. Introduction and Overview

1. **This collection of papers provides background analyses on the key policy challenges facing Croatia that were the focus of the Article IV consultation—namely, accelerating growth on a sustainable basis and reducing external and financial vulnerabilities.** Success on these fronts is critical for achieving the authorities' ambitious medium-term macroeconomic objectives specified in their *Strategic Development Framework for 2006–2013*.[1]

2. **Raising the economy's actual and potential growth rate will require significant productivity-enhancing reforms.** Chapter II examines the factors and constraints that affect recent and potential growth, as well as policies that can influence it. On current policies, it estimates Croatia's potential growth rate at 4–4½ percent, a result reasonably robust to different methodologies. To increase growth to a higher rate in line with the authorities' aspirations, the analysis highlights the critical need to improve the business environment through further measures to reduce the administrative burden, legal uncertainties, and corruption. It also emphasizes the importance of attracting more greenfield foreign direct investment, and reforms to reduce the role of the state in the economy through fiscal consolidation and faster privatization.

3. **A significant reduction in public expenditure would be needed to simultaneously provide room for cutting taxes, also with a view to boosting growth, and lowering the budget deficit to help narrow the current account deficit.** Using the IMF's Global Fiscal Model, the analysis in Chapter III suggests that a strategy of cutting expenditure and taxes while also reducing the deficit would stimulate investment and labor supply, leading to higher output and consumption, and a lower current account deficit. Moreover, the benefits of such a strategy would increase at least proportionately to the degree of ambition in reducing public expenditure. The simulations suggest that a corporate income tax cut could produce strong benefits. The simulations also suggest that cuts in social security contribution rates, by raising employment and improving competitiveness, have clear merits, which are likely to be even higher than in the model simulations. In any event, with Croatia's expenditure-to-GDP ratio well above regional peers, there is surely scope for significant expenditure savings.

4. **Balance-sheet analysis indicates that vulnerabilities have increased, in particular in the private non-financial sector.** As indicated in Chapter IV, this reflects a rapid build-up of external debt and deepening financial euroization in Croatia. Expressed as a percentage of GDP, gross, net, and short-term external debt rose sharply between 2000 and 2005, while the debt service burden has remained broadly stable, helped by low international interest rates in that period. This debt build-up has been fueled mostly by private demand for

[1] We thank participants at a seminar at the Croatian National Bank for their insightful comments.

credit, as the public sector net financial position has not significantly deteriorated. However, firms and households have accumulated large net liabilities that are sensitive to changes in exchange and interest rates. These increased vulnerabilities place a premium on avoiding sharp exchange rate and interest rate movements. They also imply an important role for prudential supervision, including gathering accurate information on the financial positions of firms and households, and preventing an excessive build-up of banks' foreign currency exposures to unhedged clients.

5. **Rapid credit growth raises banks' susceptibility to an economic downturn.** Chapter V finds that a growth slowdown could have a large negative effect on bank capitalization, by affecting borrowers' ability to service their loans. Banks should therefore build buffers during good times either by raising capital or provisions on unidentified losses, rather than relying on collateral as much as they do now. The analysis also finds that Croatian banks are not necessarily passing on the higher risk of foreign exchange-linked loans to unhedged clients by charging higher interest rates, possibly due to the strong competition among the top banks. Thus, the possibility that the risk premium embedded in loan interest rates is too low makes building up provisions or raising capital even more important. These conclusions are consistent with analyses undertaken at the Croatian National Bank.

II. Economic Growth in Croatia: Potential and Constraints[1]

A. Introduction

1. **Croatia has experienced solid economic performance in recent years, though room remains for improvement**. Real GDP growth has averaged about 4¾ percent over the past five years, close to performance in peer countries. But—despite Croatia's relative wealth by transition country standards, among other advantages—export performance has been below par, and survey measures of competitiveness consistently point to a difficult business environment.

2. **This chapter examines recent and prospective economic growth performance, with a view to answering the** following **questions**:

- What pace of economic growth can Croatia expect in the medium term?
- What factors *drive* recent and expected growth, and how can policies support them?
- What factors are *constraining* economic growth, and how can policies tackle them so as to raise Croatia's growth potential?

This paper is therefore a central part of the 2006 Article IV consultation, which focuses on the macroeconomic outlook, raising potential growth, and reducing vulnerabilities.

3. **The quest for economic growth has a number of facets**. Questions related to what determines the potential growth rate and what reforms could increase it should be central to deciding a country's policy agenda. In the context of the Croatian economy, a relevant question is the extent to which the solid growth performance in recent years has been driven by fundamentals and therefore can be considered sustainable, and to what extent it has been driven by temporary factors. Structural reforms related to the transition process since the mid-1990s and to EU harmonization more recently, as well as macroeconomic adjustment to safeguard economic stability in recent years, should have increased Croatia's potential growth rate. Looking forward, policymakers need to know what policies and reforms could increase Croatia's growth rate further and lead to a faster income convergence to the EU.

4. **The chapter is set out as follows**. Section B summarizes the main features of recent economic performance and surveys some of the potential underlying determinants. Section C estimates potential growth for Croatia over the next five years using the standard statistical and production-function methodologies. Section D corroborates these estimates using a cross-country econometric model for growth, and draws out some implications of how policy reforms could influence growth. Section E takes a different perspective by using the "growth

[1] Prepared by David Moore and Athanasios Vamvakidis.

diagnostic" approach to identify the binding constraints on growth. Section F concludes with a discussion of policies to enhance Croatia's growth potential.

B. Stylized Facts and the Determinants of Economic Growth

5. **Economic growth has been solid in recent years, though slightly below regional standards**. Real GDP growth averaged 4¾ percent annually over 2001–05, slightly below the peer country average over 2001–05 of 5¼ percent (Figure II.1).[2] Nevertheless, this performance represents a pickup from Croatia's average economic growth of just under 3½ percent annually over 1996–2000. Recent growth has relied on strong domestic investment.

6. **Export performance has been disappointing**. Real export growth averaged just over 6 percent annually during 2001–05, significantly below the peer country average (over 9 percent). In contrast to GDP growth, export growth fell compared to the previous period (average 6¾ percent over 1996–2000). At the same time, recent economic performance has been associated with heightened external vulnerabilities.[3] External debt jumped from 60½ percent of GDP at end-2000 to 80 percent by end-2004, subsequently increasing to a projected 84 percent at end-2006. The current account deficit during 2001–05 averaged 6 percent of GDP; for 2006, available data indicate that the current account deficit widened to around 8 percent of GDP.

7. **Total foreign direct investment (FDI) into Croatia is close to the regional average—but with a high share from privatizations and/or in the financial sector, "greenfield" FDI remains well below potential**. Net FDI inflows averaged just below 5 percent of GDP annually during 2001–05, of which 1½ percent of GDP from privatizations. The financial sector has received a very large share of FDI (both privatization and new capital), whether looking over an extended period (28 percent of total inflows over 1993–2005) or more recently (over 50 percent of FDI in 2005, partly reflecting capital injections to foreign-owned banks). Nonprivatization FDI inflows to Croatia have been modest. In a cross-country study for southeastern Europe, Demekas, Horváth, Ribakova, and Wu (2005) estimate a gravity model for "potential" nonprivatization FDI using data to 2003; the estimated gap (underperformance) between actual and potential FDI in Croatia is one of the largest in the region. UNCTAD data on the number[4] of new greenfield FDI projects also indicate that Croatia has lagged in attracting new investors (Figure II.2).

---

[2] For a detailed discussion on the factors behind Croatia's growth experience in the late 1990s, see Vujčić and Lang (2002).

[3] Accordingly, policies aiming to mitigating external vulnerabilities were central to the authorities' program under Croatia's 2004–06 Stand-By Arrangement.

[4] These data should be interpreted cautiously in the absence of comparable data on the size of projects.

8. **Croatia's progress in transition has lagged the top reforming countries.** Looking at Croatia's reform progress in recent years in more detail, progress relative to other economies has been slower in a number of areas. According to the EBRD transition indicators (up to 2005), Croatia's overall transition compares well with most south and eastern European economies, but lags behind transition in central European economies (Figure II.3). Croatia's transition rank has not changed during recent years (Figure II.4) despite progress in all aspects of transition (Figure II.5). And Croatia still lags behind most other transition economies in competition policy, large-scale privatization, and price liberalization (Figure II.6). According to the EFN index of economic freedom (up to 2004), Croatia has progressed in most areas of macroeconomic and structural reform measured by the index (Figure II.7), but by less than the rest of the world (Figure II.8). As a result, Croatia's ranking for the overall EFN index has fallen over the past ten years.

9. **A vast empirical literature has identified a multitude of factors that can determine economic growth**.[5] Based on the main results from this literature, we compare below the main possible determinants of growth in Croatia with those in the rest of Europe. These results also allow us to simulate an empirical growth model for Croatia, estimate Croatia's potential growth, and quantify the growth impact of economic and structural reforms (see Section D).

10. **Several stylized facts emerge from a cross-country comparison of growth determinants**. The Appendix compares the main growth determinants in Croatia with selected neighboring and regional economies in southeastern Europe (SEE), other peer economies in central and eastern Europe (CEE), and the euro area. The table in the Appendix shows several alternative indicators for each growth determinant for recent years, depending on data availability. The literature has found that each of these variables significantly affects economic growth. Cross-country comparisons of their values can provide an indication of the factors that are driving growth in Croatia relative to other countries in Europe, and of the factors in which Croatia lags behind and on which reforms should therefore focus in order to increase growth in the future. According to these comparisons:

- Croatia compares well with other transition economies with respect to:

  - *potential for convergence*, with a real per capita GDP reaching 43 percent of the euro area average;

[5] For more details, see Levine and Renelt (1992); Fischer (1993); Barro and Sala-í-Martin (2004); George, Oxley, and Carlaw (2004); Helpman (2004); Aghion and Durlauf (2005); and the Economic Growth Resources website (http://www.bris.ac.uk/Depts/Economics/Growth/, updated by Jonathan Temple).

- *public sector investment*, spending considerably more as a share of GDP than other SEE and CEE countries;

- *monetary policy*, with low inflation, broadly in line with inflation rates in most of the rest of Europe;

- *demographics*, with a high dependency ratio but similar to that in the rest of Europe;

- *infrastructure*, where based on EBRD indicators reform is close to what seen in other transition economies;

- *human capital*, with enrollment ratios and spending per student close to the rest of Europe for both primary and secondary education, and a level of labor force education that does not give particular reason for concern—although more detailed data are more alarming (see Section E);

- *health of the population*, according to most indicators, although this comes at a relatively high cost since Croatia's public sector spends considerably more on health care as a share of GDP than both the SEE and CEE countries;

- *the new economy*, with the use and production of information technology broadly as developed as in the CEE, although less than in the euro area;

- *financial sector*, with a more advanced banking sector than that of most SEE and CEE countries and a limited presence of the state in the sector;[6] and

- *international trade*, with all indicators suggesting a very open economy.

- Croatia does not compare as well with other transition economies with respect to:

  - *private sector investment and FDI*, which as shares of GDP have been below those in other CEE countries, in particular for greenfield FDI;

  - *fiscal policy and government size*, with general government spending as a share of GDP well above levels in the SEE and the CEE countries, in turn causing a higher deficit and a higher public debt-to-GDP ratio despite fiscal consolidation in recent years;[7]

---

[6] Two accompanying Selected Issues papers investigate the main financial risks and vulnerabilities in Croatia.

[7] Although a fiscal expansion can lead to faster growth in the short run, it leads to slower long-run growth if it jeopardizes fiscal sustainability, or if it crowds out the private sector.

- *transition*, lagging behind the CEE countries, particularly in large-scale privatization, enterprise restructuring, competition policy, and price liberalization, and with a more significant role of the state in the economy than in the rest of Europe;

- *the business environment*, which is less friendly than the business environment in the CEE countries and in the euro area according to almost all indicators (Figure II.9);

- *the legal system*, with indicators for property rights, contract enforcement, and corruption less favorable than in both the CEE countries and the euro area; and

- *the labor market*, with a relatively high unemployment rate, in particular for the long-term unemployed and the young, and a low labor force participation rate, which very likely result from limited labor market flexibility—the indicators considered suggest that Croatia has a more rigid labor market than both the SEE and the CEE countries (see below on employment protection legislation; see also Tonin (2005)).

C. Potential Growth Estimates for the Croatian Economy

11. **Estimates of potential output growth can be a useful tool in economic policy.** They provide a guideline for medium-term growth projections; they are used to estimate a cyclically-neutral budget balance; they can determine if actual growth is driven by temporary factors or by changes in the potential of the economy to grow faster; and they can guide decisions in setting the reform agenda. Moreover, estimates of the output gap—derived from actual and estimated potential output—can indicate inflationary pressures in the economy.

12. **For transition economies, estimates of potential growth are necessarily tentative**. Data problems, such as unavailability of some key variables, relatively short time-series, measurement issues, and frequent changes in statistical methods can make this task very difficult for most of these economies. Furthermore, the process of structural transformation that has been taking place during the transition period raises questions about the use of historical data to estimate potential growth and, more generally, the use of recent trends to determine future prospects. But with these caveats, almost fifteen years of economic transition in Croatia provides enough information to attempt the empirical exercise of estimating potential growth. Using a number of alternative empirical methodologies to estimate potential growth could partly address some of the above concerns.

13. **This chapter uses three methods to estimate Croatia's potential growth:**

- The Hodrick-Prescott (HP) filter: this is a univariate statistical method that removes short-run fluctuations, resulting in a series whose smoothness is determined by a parameter choice;

- Estimation of a production function: this method assumes that Croatia's production function can be approximated by the Cobb-Douglas technology with two-factors, capital and labor, and with constant returns to scale; and

- Simulation of a growth empirical model for Croatia: the coefficient estimates from a cross-country growth regression are used to derive Croatia's potential output growth, based on the current values of the growth determinants in Croatia.

14. **These methods suggest that Croatia's potential growth is somewhere above 4 percent.** Table II.1 summarizes the results. The average of these estimates (taking the middle estimate from the growth regression) is 4.3 percent. The following sections explain these calculations in detail.

Table II.1. Croatia: Potential Real GDP Growth

Based on:	
Hodrick-Prescott filter	4.4
Cobb-Douglas production function	4.3–4.4
Growth regression:	
assuming most of transition is still ahead	5.1
assuming the transition process had reached a mid-point	4.2
assuming the transition process has been completed	3.2
Average	**4.3**

The Hodrick-Prescott filter

15. **The Hodrick-Prescott (HP) filter is one of the simplest and most widely used methodologies to estimate potential growth**. It is a filter used to obtain a smooth estimate of the long-term trend component of a series.[8] Real GDP growth data for Croatia start in 1994. To avoid a bias from the latest available data point—the HP filter puts too much weight on recent observations—we extend the series up to 2007, based on the latest

[8] For details, see Hodrick and Prescott (1997).

projections of the World Economic Outlook. The HP filter gives real GDP growth of 4.4 percent for 2006, which is taken as an estimate of potential growth for Croatia.

Estimating a production function for Croatia

16. **The following estimates a two-factor production function for Croatia**. The production function includes capital and labor:

$$Y(t) = A(t)\, F[K(t), L(t)] \qquad (1)$$

where Y is real GDP; A is an index of the level of technology, also called total factor productivity (TFP); K is capital; and L is employment.

17. **The real growth rate can be decomposed, assuming Cobb-Douglas technology and constant returns to scale, as follows:**

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \alpha \frac{\dot{K}}{K} + (1-\alpha)\frac{\dot{L}}{L} \qquad (2)$$

where α is the share of rental payments to capital in total income and (1- α) is the share of wage payments to labor in total income, assuming competitive product markets.[9]

18. **We estimate the above equation for Croatia using multiple sources for capital stock data**. All data sources are from the IMF World Economic Outlook (WEO, October, 2006), except the data for average wages, which are from the Croatian National Bank (CNB), and historical data for the capital stock, for which we use two alternative series. The first is estimates provided by the CNB for the period 1994–2005 using the perpetual inventory method. The second is based on direct calculations of the capital stock by sector for the period 1999–2003, provided by the Croatian Central Bureau of Statistics (CROSTAT). For the years before and after these periods, the capital stock is estimated based on the perpetual-inventory method, using WEO data for investment and assuming a rate of capital depreciation of 2.7 percent, which is the estimate used by CROSTAT. Although measuring the capital stock directly may be preferable to estimates using the perpetual-inventory method, the CROSTAT data are still preliminary and may change. Therefore, the discussion that follows addresses results from both methodologies.

19. **The estimates require several further assumptions**. Croatia's employment income share is calculated as the ratio of the total wage bill (average wage times total employment) over nominal GDP. For future years, Croatia's average wage is assumed to grow by 6 percent, which is equal to its average growth in recent years. This gives an employment

[9] For more details, see Barro and Sala-í-Martin (2004).

income share of about 0.47–0.51, depending on the year. Based on the constant returns to scale assumption, the capital income share is one minus the employment income share, or 0.49–0.53.[10] Applying the HP filter to derive the trend TFP growth implies potential TFP growth of 1.6 percent, which is used as a projection for future years.

Table II.2. GDP Growth and Contributions: Estimates from a Production Function for Croatia

	1996–2001	2002–05	2006–09
Using CNB capital stock estimates			
Real GDP growth	3.6	4.7	4.4
Contributions:			
Capital	3.2	2.7	2.8
Labor	-1.0	0.9	0.5
Productivity	1.5	1.1	1.1
Using CROSTAT capital stock estimates			
Real GDP growth	3.6	4.7	4.3
Contributions:			
Capital	1.5	2.2	2.2
Labor	-1.0	0.9	0.5
Productivity	3.2	1.6	1.6

20. **The production function-based estimates in Table II.2 suggest that Croatia's potential growth is between 4.3 and 4.4 percent**. The estimates suggest that the growth of Croatian output has been primarily driven by capital accumulation, with only a limited contribution from TFP growth in recent years and even less from employment. To some extent, this is not surprising. Croatia was newly independent and a new market economy in the aftermath of a war. Infrastructure investment and rebuilding regions that were destroyed during the war should have led to a high growth contribution of capital during the 1990s. Indeed, as noted in Section B, the share of public investment in GDP has been much higher in Croatia than in other transition economies. In more recent years, privatization and high interest from domestic and foreign investors is expected to have also contributed to growth, although Croatia's private investment share in GDP is not as high as in more advanced transition economies (see Section B, and Appendix). The estimates that use the CROSTAT

[10] Using estimates from the literature for the income share of labor in other emerging markets leads to similar results.

capital stock suggest a somewhat higher contribution from TFP growth, in particular during the 1990s, but a slightly lower potential growth.

21. **Persistently high unemployment rates and relatively low labor participation rates lead to a very limited contribution of employment to growth in Croatia**. Reforms introduced in 2003 to increase labor market flexibility may have led to the small positive contribution of labor to growth in recent years, from a negative contribution in the late 1990s. Based on the above estimates, if a period of faster employment growth allowed Croatia to reduce the unemployment rate from the present 12 percent to say 6 percent, the temporarily higher employment contribution could boost annual potential growth by ¼ percentage point, to 4.6 percent.

D. Estimating and Simulating a Growth Model for Croatia

22. **This section estimates an econometric growth model based on a large cross-country sample**. The estimates use a sample of a 109 developed and developing economies over the period 1996–2005.[11] The estimated coefficients are then used to forecast Croatia's potential growth based on the current values of the independent variables in Croatia. All data sources are as indicated in Table II.3. The empirical specification is the following:

$$(\text{Real GDP per capita growth})_i = c + \beta X_i + u, \qquad \text{for country } i = 1, \ldots, n \qquad (3)$$

The dependent variable is the average per capita real GDP growth rate for each country i; c is the constant term; β is the matrix of parameters to be estimated; X_i is the matrix of independent variables; and u is the error term. Each country has one observation, which is either the average over 10 years or the initial value in 1996, depending on the variable. Focusing on the last ten years has a number of advantages: the sample includes transition economies; some cross-country indices are not available for earlier years; and overall data quality has improved compared to previous years.

23. **Causality can be difficult to determine in growth regressions**.[12] Even though estimation with instrumental variables has confirmed the robustness of most of the above growth determinants, one has to be cautious and interpret the estimates as broad correlations, which indicate an interaction with growth that may be going both ways.

24. **Our preferred specification captures the most important, but not all, determinants of growth**. We estimated a large number of empirical specifications based on different combinations of the growth determinants that were discussed above. We selected our preferred specification by including only variables that turned out to be statistically

[11] The sample size is determined by data availability.

[12] See for example Temple (2000).

significant and robust to changes in the specification. This does not imply that the omitted variables do not affect growth, since almost all of these variables were statistically significant in some empirical specifications. Since some of these variables are alternative measures of similar aspects of the economy and are highly correlated, one has to choose those that seem to explain growth the most.

The estimated equation is (heteroskedasticity-consistent t-statistics in parentheses):

Real GDP per capita growth = 0.98(0.62) +1.88(2.71) dummy for SEE and CEE -0.49(-3.62) initial real GDP per capita –0.43(-1.78) population growth +0.14(3.58) investment/GDP –0.02(-2.29) inflation rate +0.001(3.18) credit to private sector/GDP +0.43(2.30) index of economic freedom –0.03(-3.85) cost of business start-up procedures (% of GNI per capita)

Number of observations: 109; R^2: 0.56; Adjusted R^2: 0.52; F-statistic: 15.80

25. **The results are consistent with the discussion in Section B**. Keeping everything else constant, countries with a relatively low income level, a low population growth rate (a low dependency ratio), a high investment share, a low inflation rate, and a relatively developed financial sector (measured by the ratio of private sector credit to GDP) grow faster. Both macroeconomic and structural policies affect economic growth. The index of economic freedom, which measures a number of different aspects of macroeconomic and structural policies and reforms, has a positive and statistically significant estimate.[13] Moreover, countries with high costs for starting new businesses grow more slowly. Variables measuring aspects of fiscal policy enter the regression through the index of economic freedom. Although such variables—fiscal deficit, or government consumption—have been found to affect growth negatively by a number of the studies referred to above, the chosen specification seems to explain cross-country growth differences better, at least for this period. The FDI-to-GDP ratio has a positive and statistically significant estimated coefficient, but only when the cost of business start-up procedures is not included in the regression.[14] This is because of collinearity, since countries with low costs for starting a new business attract more FDI as a result.

26. **The regression also includes a separate constant term for the SEE (including Croatia) and the CEE transition economies**. We tried a number of country dummies, but this was the only one which turned out statistically significant. Dummy variables for Africa

[13] The index of economic freedom is an average of a large number of sub-indices, which are grouped as follows (see also Table II.3): size of government, legal system and property rights, sound money, freedom to trade internationally, and regulation. For more details, definitions, and the list of indices within the above groups, see http://www.freetheworld.com/.

[14] These results are available from the authors.

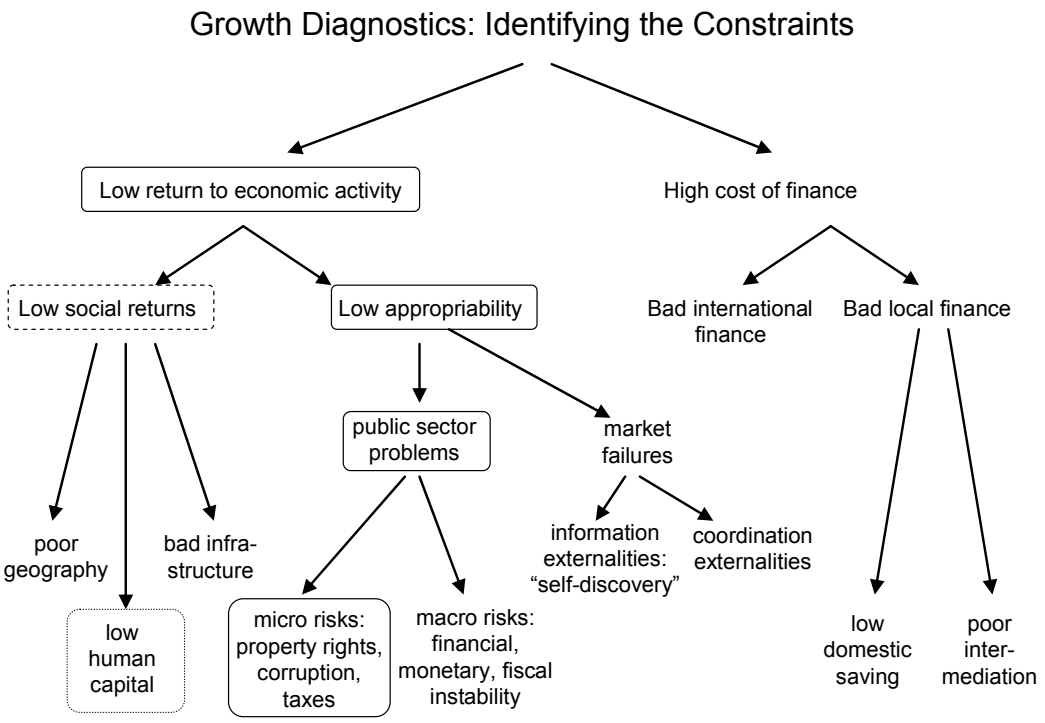
and for East Asia, although statistically significant in growth regressions for earlier decades, with negative and positive estimates respectively, do not turn out significant in this specification. The significance of the dummy variable for the SEE and the CEE transition economies suggest that they have been growing faster than what would have been expected based on the growth determinants in this model—by 1.9 percent in terms of per capita GDP. Most of these economies collapsed in the beginning of their transition during the early 1990s, while some experienced social unrest, or, as in the case of Croatia, war. However, this was followed by a strong economic recovery after the mid-1990s, as peace prevailed, the transition process moved forward, and the region's economies opened up to the rest of the world. The result may have been a growth "bonus," which, however, may not continue in the future, at least not to the same extent.

27. **The scope for "catch-up" economic growth depends on where Croatia stands in the transition process**. Using the above estimates and the latest values of the independent variables for Croatia, as indicated in the Appendix, gives the potential growth estimates in Table II.1. This simulation implies that Croatia's potential growth would be 5.1 percent (in terms of both real GDP and real GDP per capita terms). However, assuming that the growth "bonus" from transition will not continue to the same extent in the years ahead, changes this estimate to potential growth of 4.2 percent, if the growth "bonus" is reduced by half, or to 3.2 percent, if it is eliminated completely. Since the transition process is still under way, the mid-estimate of 4.2 percent seems to be a more reliable potential growth estimate for Croatia.

28. **This growth model can help forecast the impact of reforms on Croatia's economic growth**. Using the potential growth estimate of 4.2 percent as the starting point, we focus on the impact of changes in the economic freedom index and in the cost of starting a new business, which are areas in which Croatia lags behind the CEE and the euro area. If the values of these two variables in Croatia reach the average levels in the CEE through economic and structural reforms, the simulation of the above growth model suggests that Croatia's potential growth will increase to 4.6 percent. If they reach the average value in the euro area, Croatia's potential growth would increase to 4.7 percent. Finally, if they reach the level in Ireland, which has been one of the bolder reformers and stronger performers during recent years in Europe, Croatia's potential growth will increase to 5 percent. To the extent that accelerated reforms promote higher levels of FDI, especially greenfield FDI, potential growth could rise farther—though quantifying such a pickup would be beyond the scope of the model.

E. Constraints on Growth: A "Growth Diagnostic" Approach

29. **The growth diagnostic approach seeks to identify binding constraints on growth.** This approach, proposed by Hausmann, Rodrik, and Velasco (2005), stresses the need to prioritize policies to target the binding constraints, as opposed to pursuing a laundry list of "good" policies that fail to address the constraints. The decision tree below (text chart) shows where to look for the possible factors holding back private investment and economic growth.



Source: Adapted from Hausmann, Rodrik, and Velasco (2005).

30. **A process of elimination can help identify binding versus nonbinding constraints**. The starting point is to determine whether growth is being inhibited by low returns to activity (left-hand side of the tree) or high costs of finance (right-hand side). For Croatia, we can quickly exclude the factors on the right-hand side of the decision tree:

- *Bad international finance?* No. Croatia has enjoyed ample access to international finance, evident from the increase in external debt over the past several years. Moreover, Croatian bond spreads—already low by regional standards—have fallen to historically low levels (Figure II.10). If anything, this ease of access has itself had indirect costs by also easing the urgency of structural reforms (Box II.1).

- *Bad local finance?* No. Domestic saving is ample and financial intermediation strong.
    - Gross national saving averaged over 23 percent of GDP through 2002–05, high by regional standards (of CEE and SEE countries, only Slovenia had a higher saving ratio).
    - Turning to intermediation, Vujčić and Lang (2002) argue that following the rehabilitation of the banking sector and the entry of foreign banks in the late 1990s, the sector is now supporting rather than inhibiting growth. Bank credit to the private sector was 62 percent of GDP as at end-2005; rapid credit growth (also in the nonbank sector) and steadily falling interest rates (Figure II.11) also suggest strongly that the barriers to growth are elsewhere.

Box II.1: Has High External Debt Slowed Economic Reforms in Croatia?

Easily available foreign financing can delay economic reform, resulting in slower economic growth. Vamvakidis (2006) shows, using a theoretical political economy model, that government and private sector foreign borrowing makes the cost of the status quo easier to bear, resulting in postponement of necessary reforms. In this case, external financing acts like a "pain reliever" that postpones the needed treatment of a "sick" economy. Empirical evidence for a panel of developing and emerging economies for the last three decades suggests that countries that borrow more adopt macroeconomic and structural reforms at a slower pace and, therefore, have slower economic growth.

A simulation, based on estimates from the Vamvakidis (2006) model, shows the extent to which Croatia's rising external debt in recent years may have delayed economic and structural reforms. Reform progress is measured for purposes of the model using the EFN index of economic freedom. The estimated basic specification for 78 developing and emerging economies, for the period 1970–2000 is:[1]

Change in the index of economic freedom = 2.56(12.94) -0.38(-6.56) index for change in external debt/GDP -0.42(-7.02) index of economic freedom in first year of estimation + 0.07(1.00) lagged dummy variable for collapse in economic growth + 0.44 (5.95) lagged dummy variable for inflation crisis + 0.05 (3.54) index for change in external debt/GDP times index of economic freedom in first year of estimation +0.47(1.85) trade/GDP + 0.00(0.32) foreign aid/GDP.

Number of observations: 308; R^2: 0.25; Adjusted R^2: 0.24; F-statistic: 14.53

Had Croatia's external debt-to-GDP ratio remained stable during 2001–05 (instead of rising by 19 percentage points), these estimates suggest that Croatia's ranking for the index of economic freedom in the world would have been 65 out of 123 economies (instead of 76), all else constant. The estimates thus imply that eleven countries reformed faster than Croatia during this period, simply because Croatia's increase in external indebtedness reduced pressures for economic reforms.

These results highlight the potential indirect as well as the direct benefits from slowing down external borrowing. Lower external borrowing has the obvious direct benefit of reducing external vulnerabilities. The model implies that lower external borrowing would also indirectly benefit Croatia by contributing to a faster pace of reform and, through this channel, to faster potential economic growth. Indeed, curbing external borrowing has been one of the main targets of macroeconomic policy in recent years.

---

[1] Heteroskedasticity-consistent t-statistics in parentheses. For a detailed discussion of the empirical specification and robustness tests, see Vamvakidis (2006).

31. **The analysis thus focuses in more detail on low returns to economic activity.** The low returns hypothesis is consistent with the earlier observations that overall investment is high by regional standards; private investment and real GDP growth slightly below average; and export performance significantly below average. It is also consistent with relatively low levels of FDI, since foreign investors are much less likely than local entrepreneurs to be

financially constrained. The next step is to consider whether the problem is low social returns (that is, low total economic returns on factor accumulation, regardless of their ultimate recipient), or low "appropriability", i.e., low private returns even if social returns are high (for example, because of taxes, corruption, market failures, or some other cause).

32. **Low social returns—stemming from human capital problems—are one candidate explanation**. Three factors can explain low social returns, though the first two can be readily ruled out for Croatia:

- *Geography?* On the contrary, Croatia's location gives it ready access to central, Mediterranean and southeastern Europe; and its long (and beautiful) coastline underpins the vital tourism industry (tourist receipts account for over 20 percent of GDP).

- *Infrastructure?* Croatia's infrastructure compares favorably by regional standards (Figure II.12), and EBRD indicators also point to progress in infrastructure reform. Indeed, public expenditure on infrastructure has been high in Croatia: for example, spending on highway construction (investment spending by the HAC and HC road funds) averaged nearly 2½ percent of GDP over 2002–06. Thus, infrastructure does not appear to be constraining growth.

- *Human capital?* Although education and literacy levels are in line with regional standards, the Institute for Public Finance (IJV, 2004) finds that "employees in the Republic of Croatia do not have the skills, knowledge, and abilities necessary to develop globally competitive products and to compete in the European Union."

33. **A lack of skilled human capital could be a constraint on growth**. As noted earlier, activity rates are very low and have dropped for both men and women over the past five years. In principle this could reflect low demand for labor. However, Šošić (2004, in the IJV study) finds that the return on investment to education—rising from 7.6 percent in 1996 to 10.5 percent in 2002—is significantly above western and central European levels (around 6.5 percent). High returns to education, especially given their recent increase, are consistent with the hypothesis that a limited supply of educated workers is constraining economic growth.

34. **Low appropriability also cannot be ruled out as a growth constraint for Croatia**. The growth diagnostic approach divides the possible causes between market failures and public sector problems and inefficiencies.

35. **Reasonable levels of innovation in Croatia suggest that market failures in the form of information** externalities **are unlikely to be the problem**:

- The diversification of Croatia's export base does not seem out of line with peer countries. Klinger and Lederman (2006) report cases of export "discoveries" or "inside-the frontier innovations" during 1997–2002 for 73 countries: Croatia ranked a respectable 23rd in

terms of number of discoveries.[15] Croatia also performs satisfactorily by regional standards (Table II.3).

Table II.3. Croatia and Selected European Countries: Identified Cases of "Inside-The-Frontier" Innovation, 1997–2002

Poland	221	Moldova	33
Romania	114	Turkey	30
Hungary	90	Portugal	27
Latvia	68	Cyprus	26
Estonia	53	Slovak Republic	22
Croatia	**47**	Czech Republic	8
Greece	46	Italy	5
Slovenia	43	Spain	5
Macedonia, FYR	42		

Source: Klinger and Lederman (2006).

Table II.4. Innovation in Croatia and Selected European Countries: Patents Granted in United States and Europe

	US Patent and Trademark Office		European PO
	1993–2000	2001–05	2005
Albania	1	0	0
Bulgaria	20	21	5
Bosnia and Herzegovina	0	2	0
Czech Republic	81	141	26
Estonia	8	15	3
Croatia	**58**	**54**	**9**
Hungary	350	274	32
Lithuania	7	11	1
Latvia	5	9	0
Macedonia, FYR	0	1	0
Poland	97	83	15
Romania	22	36	20
Slovak Republic	15	20	10
Slovenia	74	88	24

Sources: U.S. Patent and Trademark Office; European Patent Office.

[15] Using 6-digit data from the UN COMTRADE database, Klinger and Lederman define a "discovery" as an export good that the country did not previously export (in a base period of 1994–96).

- Innovation—measured by new patents—is also broadly in line with peer countries (Table II.4), especially taking population size into account, albeit well behind the regional leaders Hungary and Slovenia (Figure II.13).

- But room for improvement remains. In the World Economic Forum's most recent *Global Competitiveness Report* (World Economic Forum, 2006), one of Croatia's weakest rankings was on FDI as a source of new technology—a consequence of the limited inflows of greenfield FDI.

36. **The public sector is not generating "macro risks" that obviously constrain growth**. "Financial/monetary" risks are low: indeed the CNB has successfully maintained broad exchange rate stability and delivered consistently low inflation since the mid-1990s. And following the significant fiscal consolidation since 2004, Croatia would meet—or at least is within striking distance of—the Maastricht deficit and debt criteria. However, public debt is high by regional standards, even if below the euro area average. While external vulnerabilities and the need to ensure debt sustainability are powerful arguments for further fiscal consolidation, the fiscal stance is not a direct and immediate constraint on economic growth.

37. **But the weak business environment suggests that "micro risks" from the public sector are impeding growth significantly**. Notwithstanding recent reforms (Box II.2), survey evidence consistently ranks Croatia's business environment below the average of its peers in CEE countries and the euro area (Figure II.9), though the picture is mixed compared with the SEE countries. The World Bank's *Doing Business* survey finds that it costs more and takes longer to start a new business and to register property in Croatia (text table). Furthermore, Croatia's legal system, based on indicators for property rights, contract enforcement, and corruption, does not compare well with the legal systems in the CEE and in the euro area (Appendix). Relatedly, the World Economic Forum *Global Competitiveness Report* for several years has persistently identified inefficient government bureaucracy as the most problematic factor for doing business. In the context of the growth diagnostic, these findings are consistent with growth being constrained by public sector "micro risks": problems with property rights; problems stemming from the large size of government, including inefficient bureaucracy and the high regulatory burden; and corruption.

Ease of Doing Business	2006 rank	2005 rank	Change in rank
Overall	**124**	**134**	**10**
Starting a business	100	112	12
Dealing with licenses	170	171	1
Employing workers	130	131	1
Registering property	109	109	0
Getting credit	117	117	0
Protecting investors	156	156	0
Paying taxes	58	72	14
Trading across borders	92	140	48
Enforcing contracts	28	28	0
Closing a business	80	76	-4

Source: The World Bank's *Doing Business* website.

Box II.2. Recent Business Environment Reforms

The authorities are aware of the weaknesses in the business environment and have already taken several important steps to simplify procedures at the central government level:[1]

- The hitro.hr service launched in 2005 introduced a "one-stop shop" to establish a business and provides a platform for a variety of "e-government" services.
- To assist foreign investors, the Trade and Investment Promotion Agency was activated in late 2005.
- A working group (with USAID assistance) is preparing a "regulatory guillotine" to propose elimination of obsolete and/or unnecessary regulations; its report is expected in July 2007.
- A project[2] was launched in 2002 (with World Bank and EU assistance) to improve the land cadastre and registry system to cut delays in the process of registering land and buildings. The number of pending land registration cases has been cut from 339,000 at end-2003 to 215,000 at end-2005. Land registry data was published on the internet in May 2005.
- The government established "entrepreneurial zones" on land free of ownership uncertainty to provide businesses with space, infrastructure and easier administrative procedures. Consistent with EU rules, the zones do not provide any tax incentives.

[1] For further information, see the authorities' *Strategic Development Framework for 2006–2013*.

[2] See http://www.zikprojekt.hr

38. **Looking more closely at these "micro risks," property rights and red tape are particular problem areas**.

- *Property rights and contract enforcement.* Although the *Doing Business* survey ranks Croatia favorably on contract enforcement—with the number of procedures required to enforce contracts being in line with the OECD average—contract enforcement remains slow. According to the European Commission (2006): "The judicial system has continued to suffer from slow and inefficient court proceedings, poor case management and low administrative and professional capacity. These circumstances may discourage economic actors from taking cases to court and undermine an effective enforcement of creditor and property rights."

- *Administrative and regulatory burden.* With measures under way at the central government level (Box II.2), public and private sector representatives emphasized problems at the local level during the Article IV discussions: investors often face uncertainties and delays in obtaining necessary permits and numerous and nontransparent fees, with complex local government regulations seen as conducive to corruption. In addition, employment protection legislation (EPL) is strict. Tonin (2005) calculates the OECD indices of the strictness of EPL for several central and eastern European (non-OECD) countries: Croatia

has the second-strictest EPL in the sample, and is also high by OECD standards. EPL is especially strict for temporary workers (Figure II.14). The EPL is successful in protecting jobs for existing employees (insiders), but a severe disincentive to new job creation (see also OECD Employment Outlook 2006).

- *Corruption*. According to Transparency International's corruption perceptions index (CPI; Figure II.15), Croatia suffers from "serious," though not "severe," levels of corruption.[16] The WEF (2006) Global Competitiveness Report corroborates this finding. However, Demekas, Horváth, Ribakova, and Wu (2005) find no direct evidence that corruption has dampened FDI in SEE countries, though they note that efforts to combat corruption could still stimulate foreign investment indirectly.

- *Tax burden?* Evidence is mixed. Croatia's corporate income tax rate of 20 percent is broadly in line with the CEE average. A 2006 study by the Economics Institute of Zagreb[17] estimated "forward-looking" effective average tax rates on investment for 20 countries, concluding that Croatia's tax burden is favorable and needs to be better communicated to potential foreign investors. This would suggest that the corporate income tax burden is unlikely to be the binding constraint on growth, or at least on foreign investment. On the other hand, respondents to the *Global Competitiveness Report* cite the tax burden as the third most important problem for doing business in Croatia (behind inefficient government bureaucracy and corruption). Moreover, as in several other countries in the region, social contribution rates (totaling 37 percent of gross earnings) are high.[18]

39. **In sum, the growth diagnostic indicates that public sector-related micro risks are the most important binding constraint on growth, because of their impact on the business environment**. This is consistent with the results from the previous section. The diagnostic also points to human capital problems as an additional constraint on growth.

---

[16] Transparency International categorizes corruption as "serious" for a CPI score below 5 and as "severe" for a CPI score below 3.

[17] An English-language summary of the study is available at: http://www.eizg.hr/AdminLite/FCKeditor/UserFiles/File/summary-etr.pdf.

[18] An accompanying selected issues paper adapts the Fund's Global Fiscal Model to Croatia to show that more ambitious expenditure reforms would provide room for significant cuts in taxes (possibly including cuts in social contributions), in turn stimulating investment, employment, growth, and consumption.

F. Conclusions

40. **The estimate for potential economic growth of 4–4½ percent over the medium term is robust to different methodologies**. The Hodrick-Prescott, production function and growth regression methodologies yield very similar overall results, though different capital stock estimates imply a different breakdown between capital accumulation and TFP. The authorities' medium-term aspirations for higher economic growth thus depend on structural reforms to boost TFP growth and, relatedly, to attract more greenfield FDI.

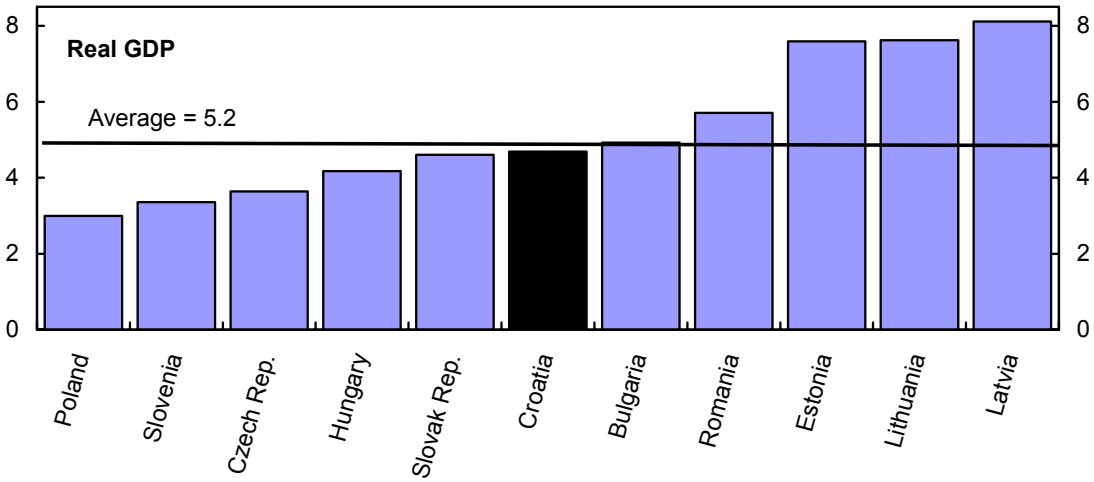
41. **The cross-country comparisons of growth determinants and the estimates from the growth regression suggest areas where economic reforms are needed to increase Croatia's potential growth**. Reducing the role of the state in the economy through fiscal consolidation and privatization would help ensure macroeconomic stability, enhance market competition, and support private sector activity. Structural reforms to create a business-friendly environment, by facilitating the start-up of new businesses, creating an efficient bureaucracy, increasing labor market flexibility, and reforming the judiciary would allow Croatia to experience growth rates closer to those observed in peer countries. The estimates also suggest that, without faster progress in these reforms, the Croatian economy could grow more slowly than in the recent past as the growth "bonus" from transition diminishes.

42. **The growth diagnostic reinforces the importance of improving the business environment**. The diagnostic approach shows that the important constraints on growth reflect neither financing problems nor a lack of ideas for investment. Rather, Croatia is not yet as good a place to do business as it could be, even allowing for recent improvements. Moreover, the diagnostic suggests that policy recommendations in other areas—for example, the expenditure and tax cuts recommended in the accompanying chapter—will yield their full benefits only if the business environment is improved as well.

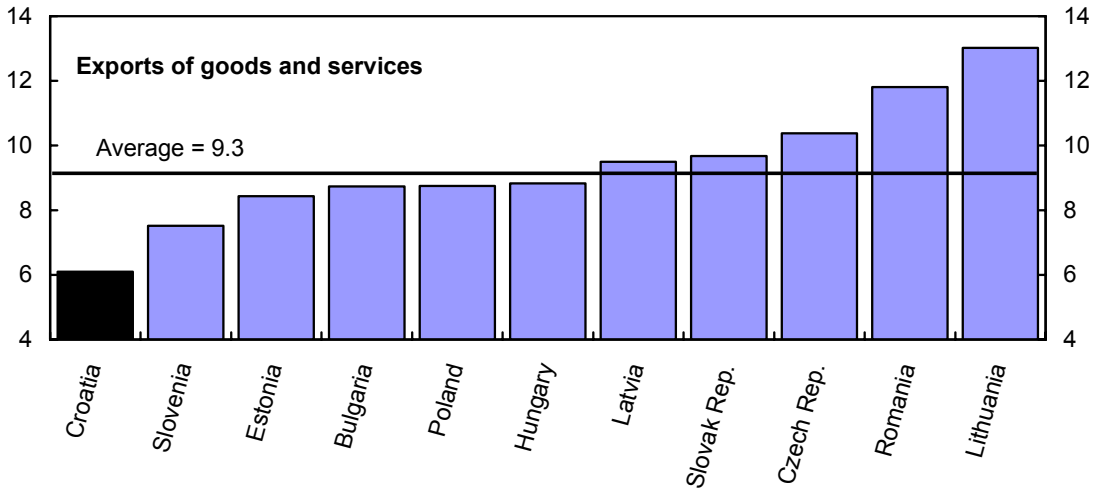
43. **The possible human capital constraint on economic growth warrants a measured policy response**. Growth will not necessarily be boosted simply by allocating more resources to education: Croatia already performs favorably on broader indicators of education and literacy. More difficult measures may nevertheless be much more fruitful. In response to the problem of insufficiently skilled employees, encouraging "lifelong learning" could boost labor productivity and growth. Also, consolidating the numerous welfare benefits could help address disincentives to labor-market participation.

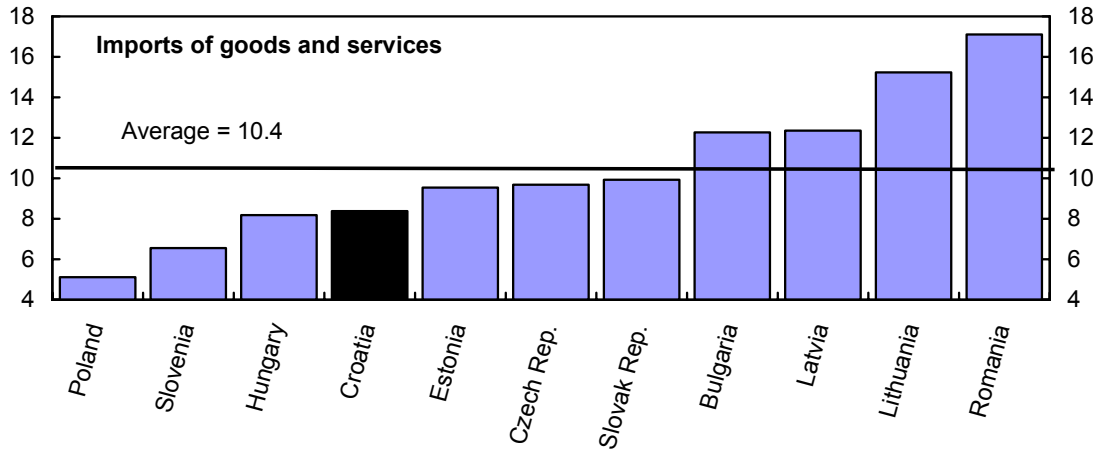
Figure II.1. Growth and Trade: Croatia and Selected European Countries
Geometric real growth rates, 2001–05

GDP growth is slightly below the average of its regional peers and well below the leaders ...



... and foreign trade has expanded slowly by regional standards, with an ECB gravity model suggesting that Croatia's trade with the euro area may be well below potential. 1/



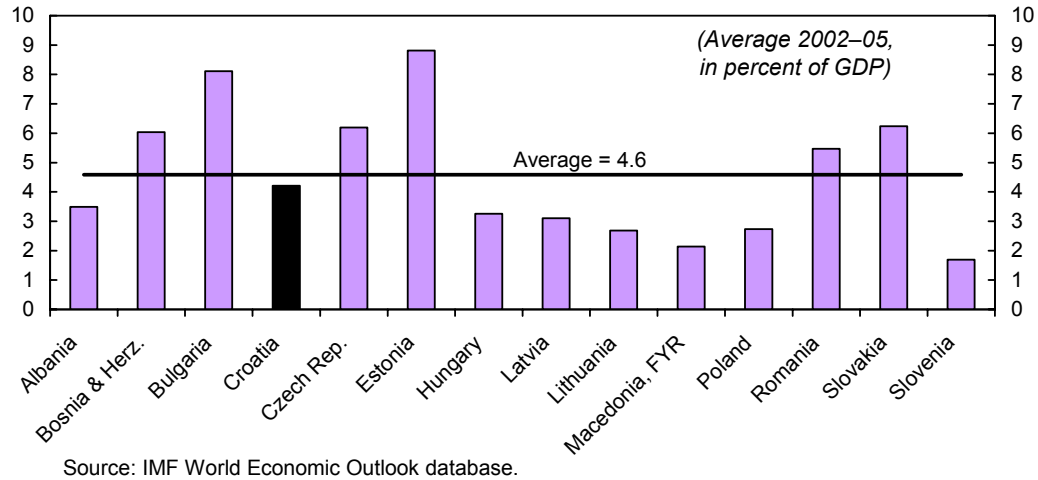


Source: IMF's *World Economic Outlook* database.

1/ Bussière, M., J. Fidrmuc, and B. Schnatz, "Trade Integration of Central and Eastern European Countries: Lessons from a Gravity Model," ECB Working Paper 545, November 2005.

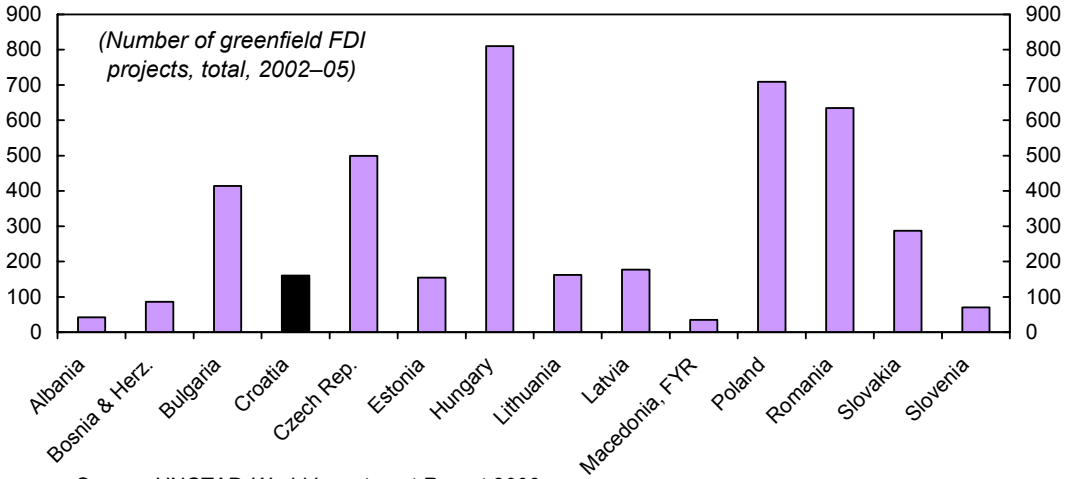
Figure II.2. Croatia and Selected European Countries: Foreign Direct Investment, 2002–05

Net foreign direct investment (FDI) into Croatia has approached the regional average, but with a high share from privatizations and/or in the financial sector.



Source: IMF World Economic Outlook database.

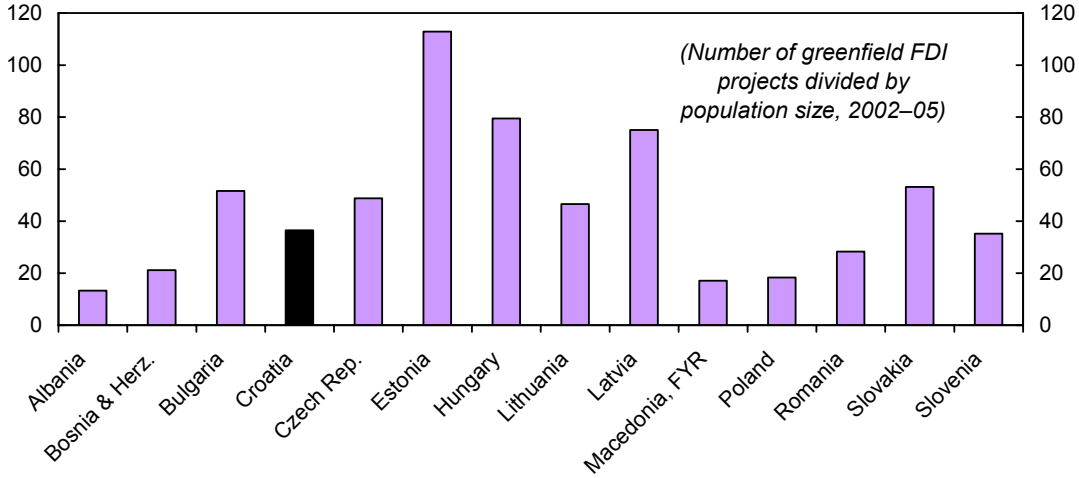
Available data indicate that Croatia has lagged in attracting greenfield FDI, whether looking at the total number of new projects ... 1/



Source: UNCTAD *World Investment Report 2006*.

1/ These data should be interpreted cautiously in the absence of comparable data on the size of projects.

... or adjusting for population size.



Sources: UNCTAD; and Fund staff estimates.

Figure II.3. EBRD Average Transition Indicator, 2005

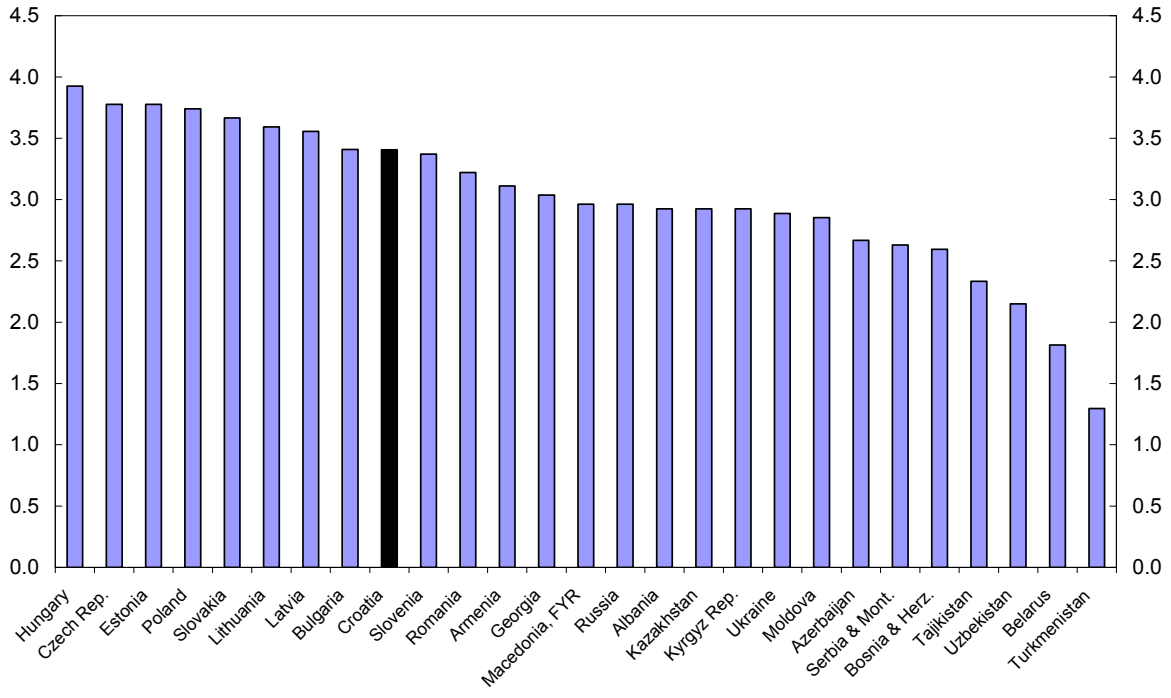
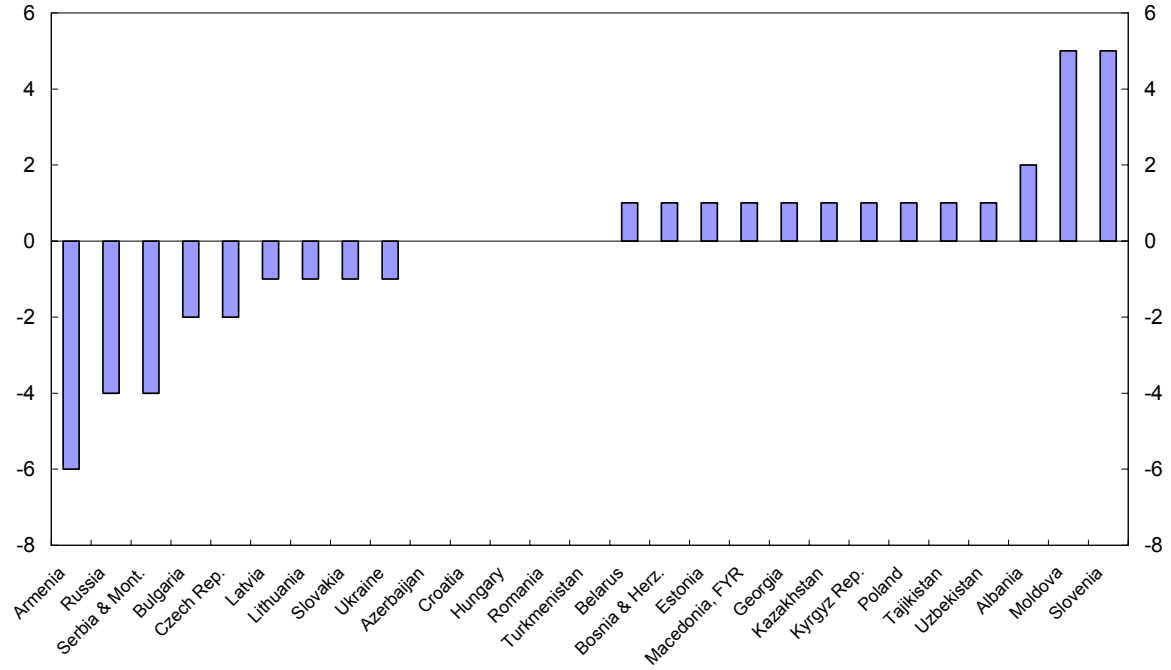


Figure II.4. Change in Rank in EBRD Average Transition Indicator, 2000–05



Source: European Bank for Reconstruction and Development.

Figure II.5. Croatia, Change in EBRD Indices, 1995–2005

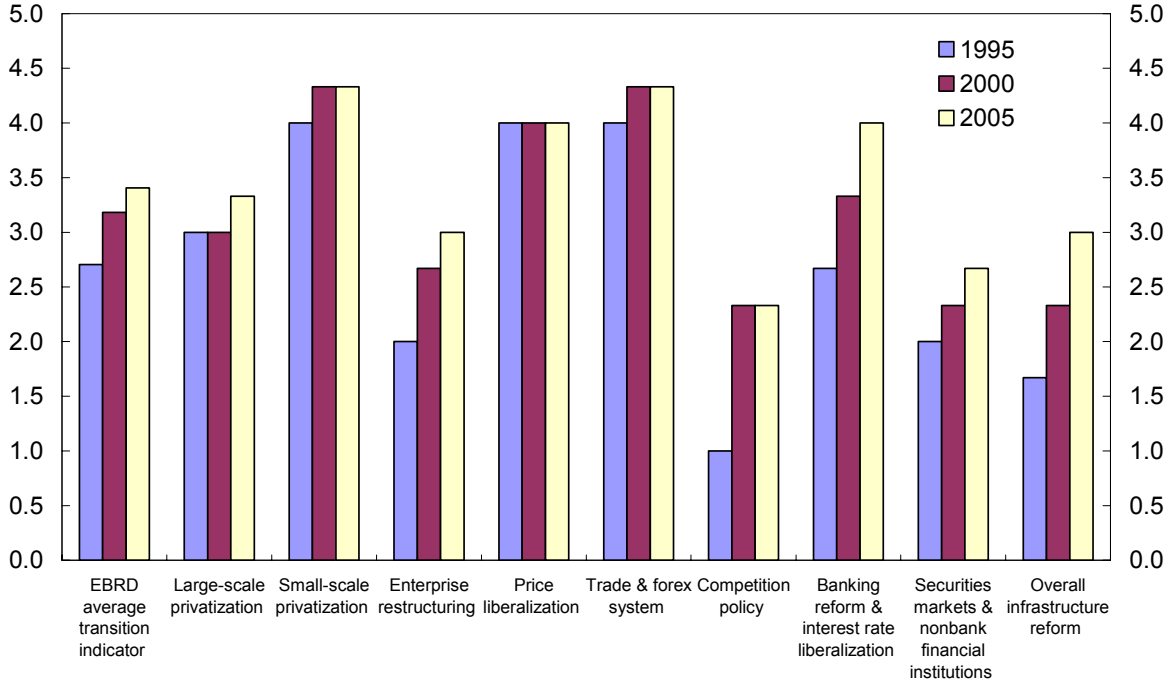
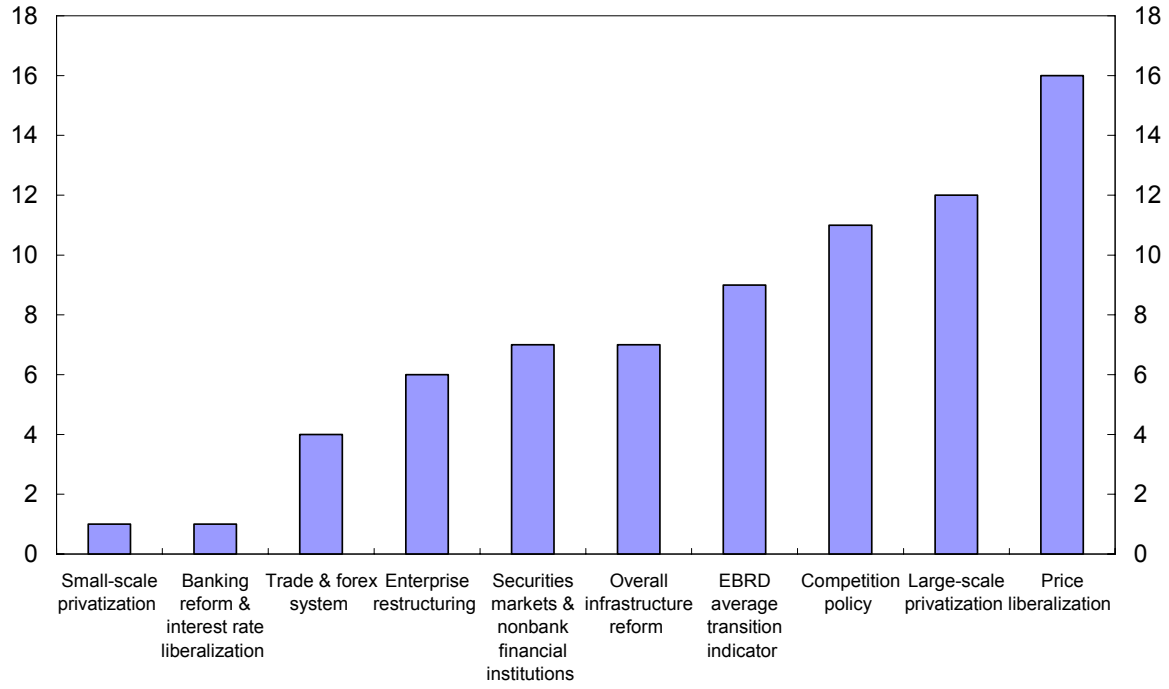


Figure II.6. Croatia, Ranking in EBRD Indices, 2005

(Out of 27 countries)



Source: European Bank for Reconstruction and Development.

Figure II.7. Croatia's Macroeconomic and Structural Reforms, 1995–2004

(Index 1 to 10)

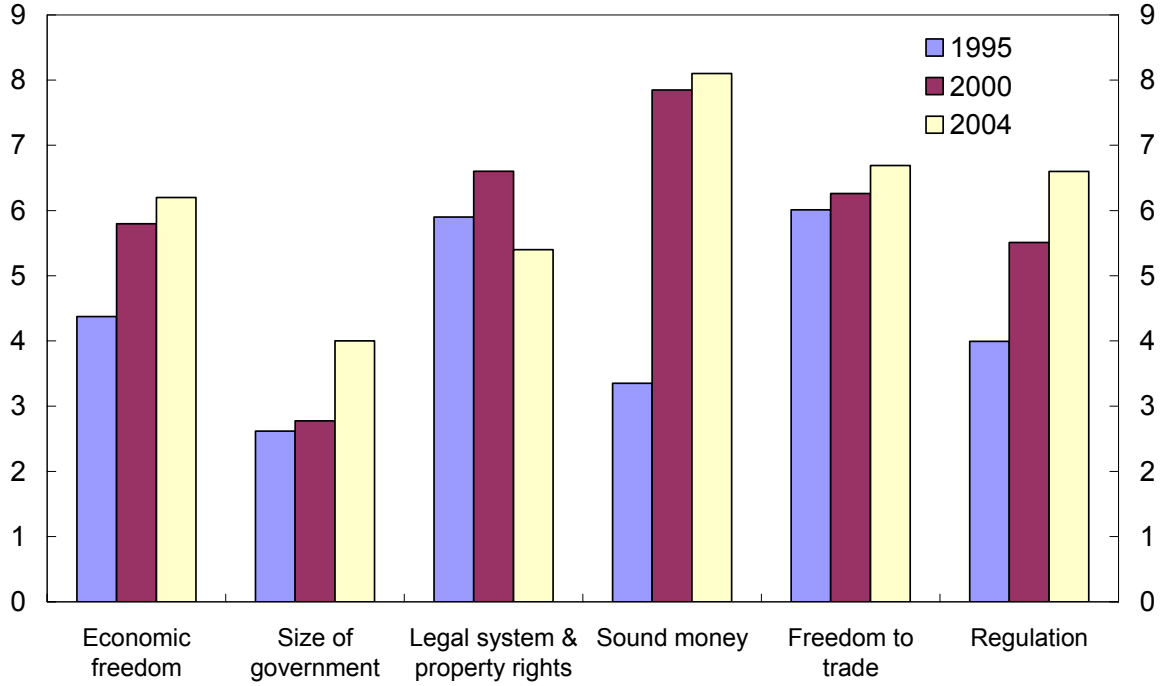
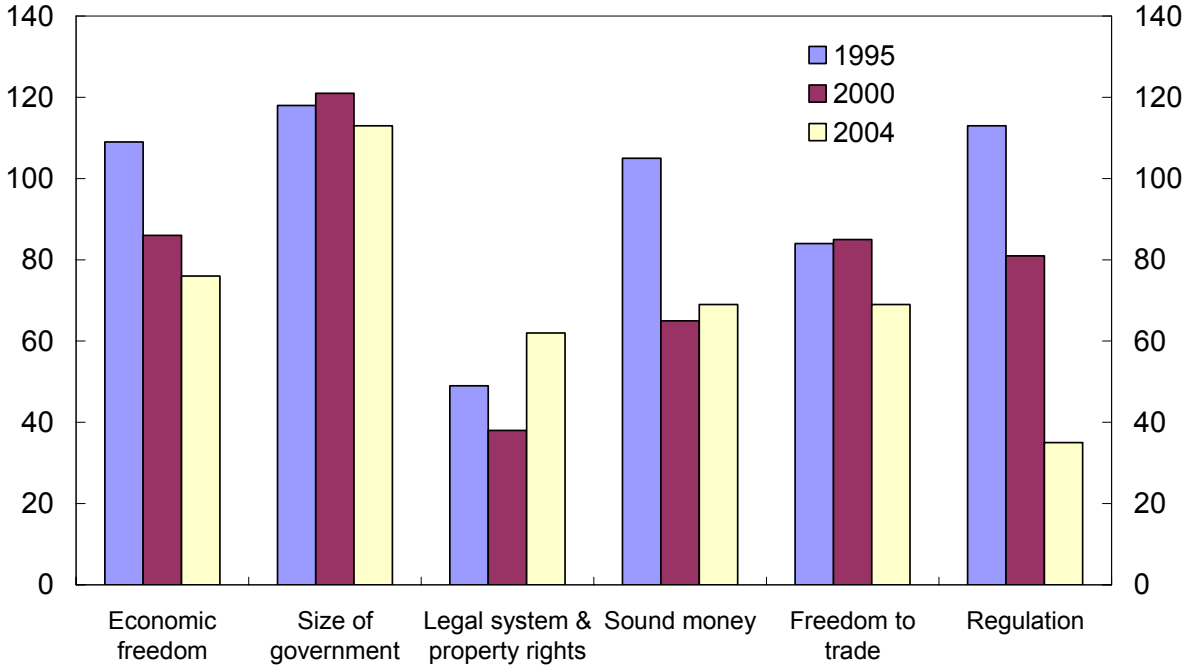


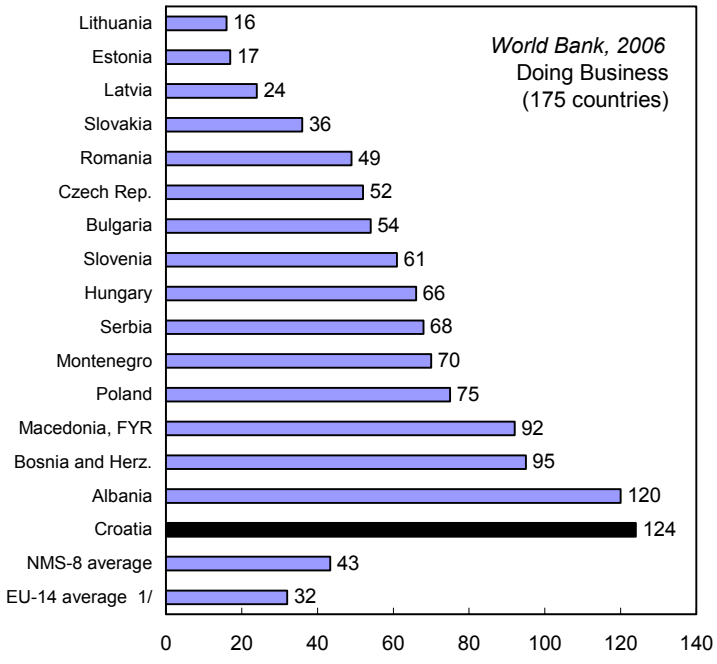
Figure II.8. Croatia's Rank in the World in Macroeconomic and Structural Reforms, 1995–2004

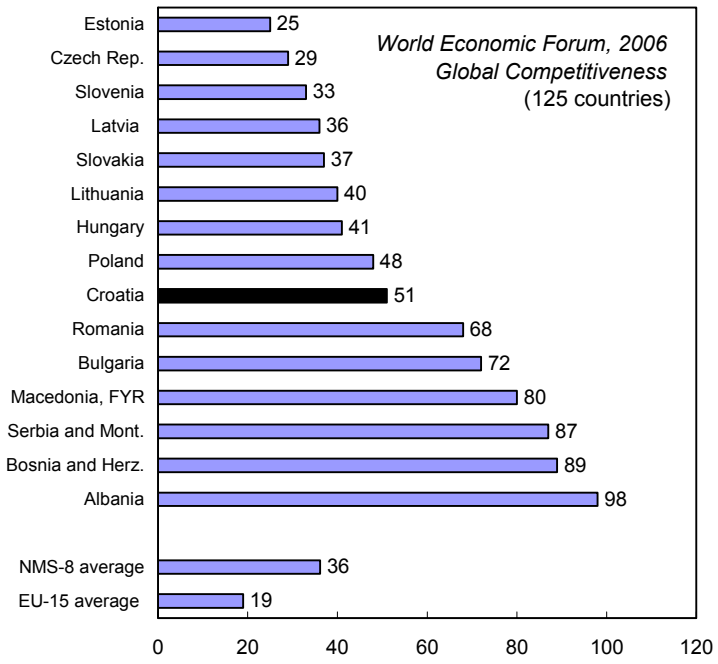


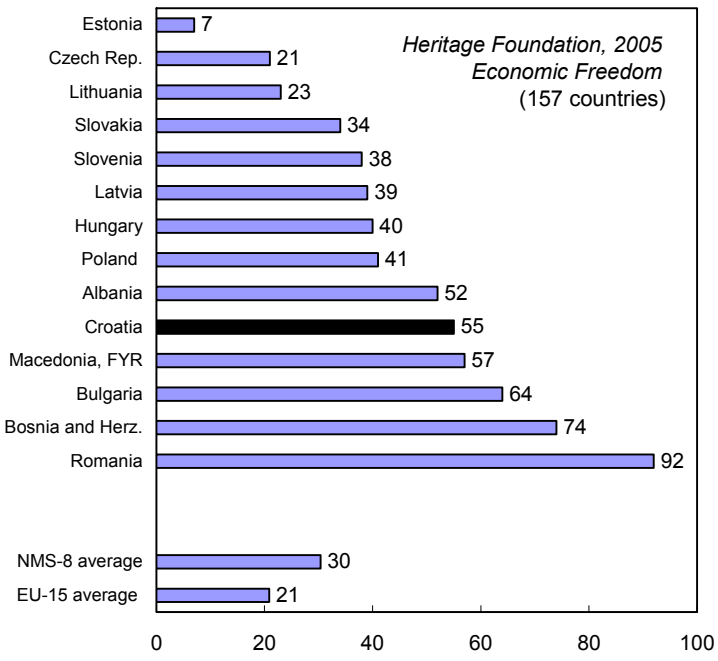
Source: Economic Freedom Network.

Figure II.9. Croatia and Selected European Countries: Business Environment, 2005–06

Croatia consistently performs below the average of its peers in central and eastern Europe in various cross-country rankings of business environment indicators.



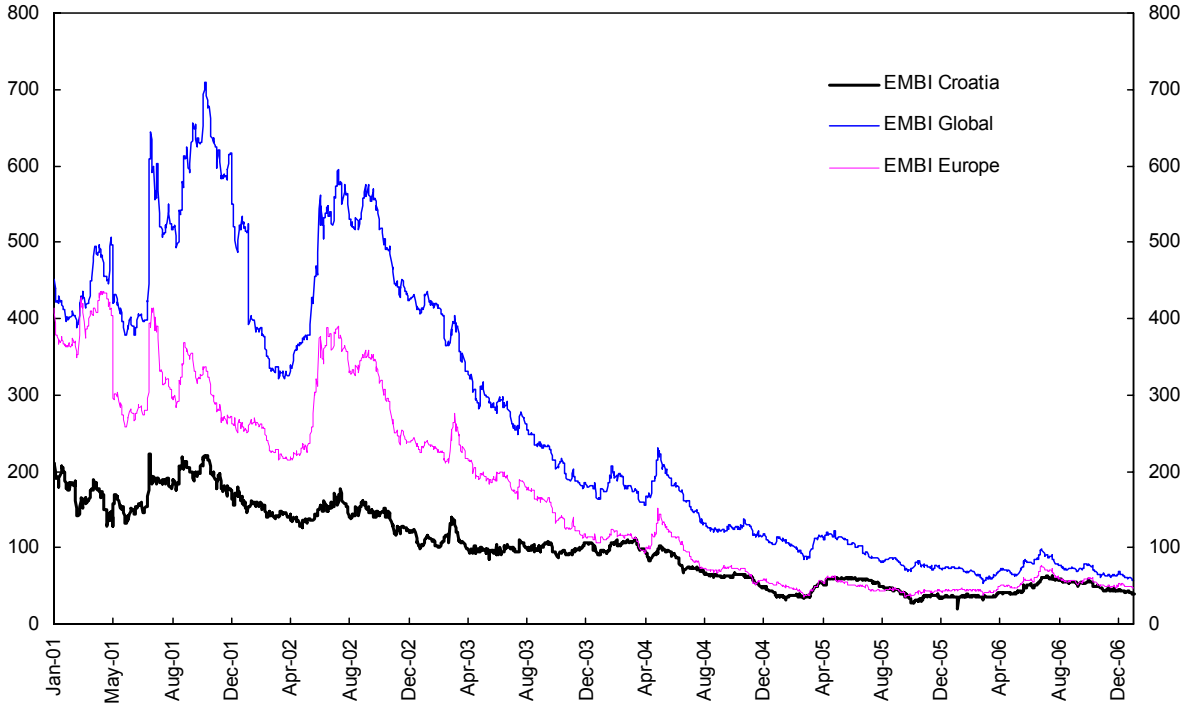




Sources: World Bank; World Economic Forum; Heritage Foundation.

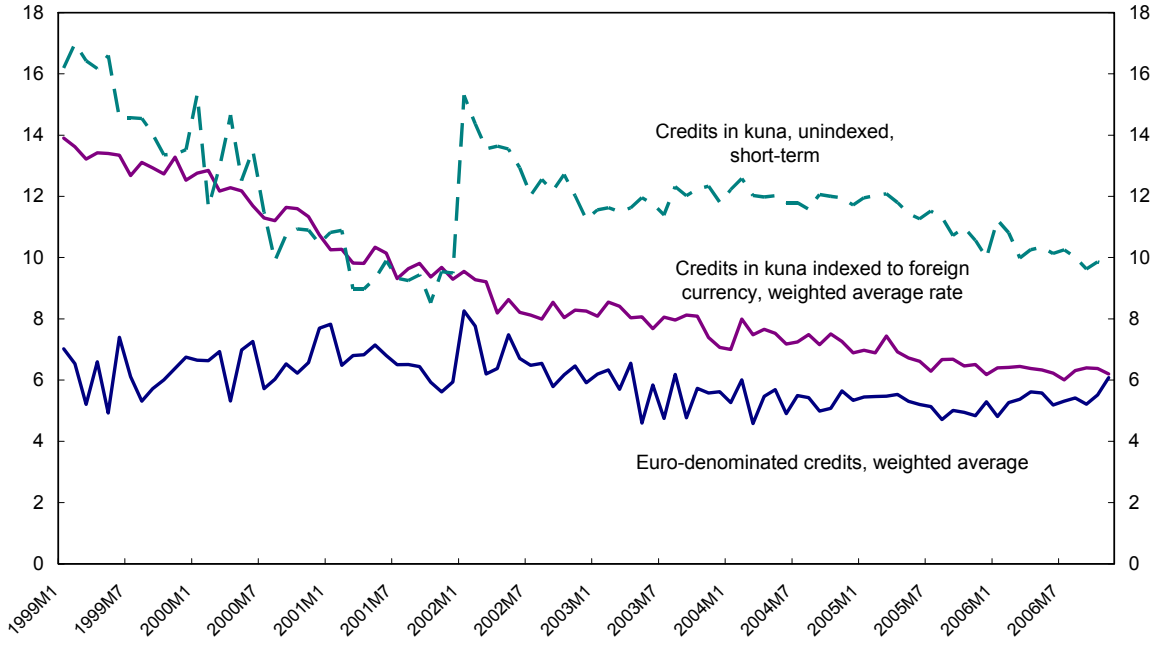
1/ No ranking available for Luxembourg.

Figure II.10. Croatia and Selected Regions: Sovereign Bond Spreads, 2001–06
(In basis points)



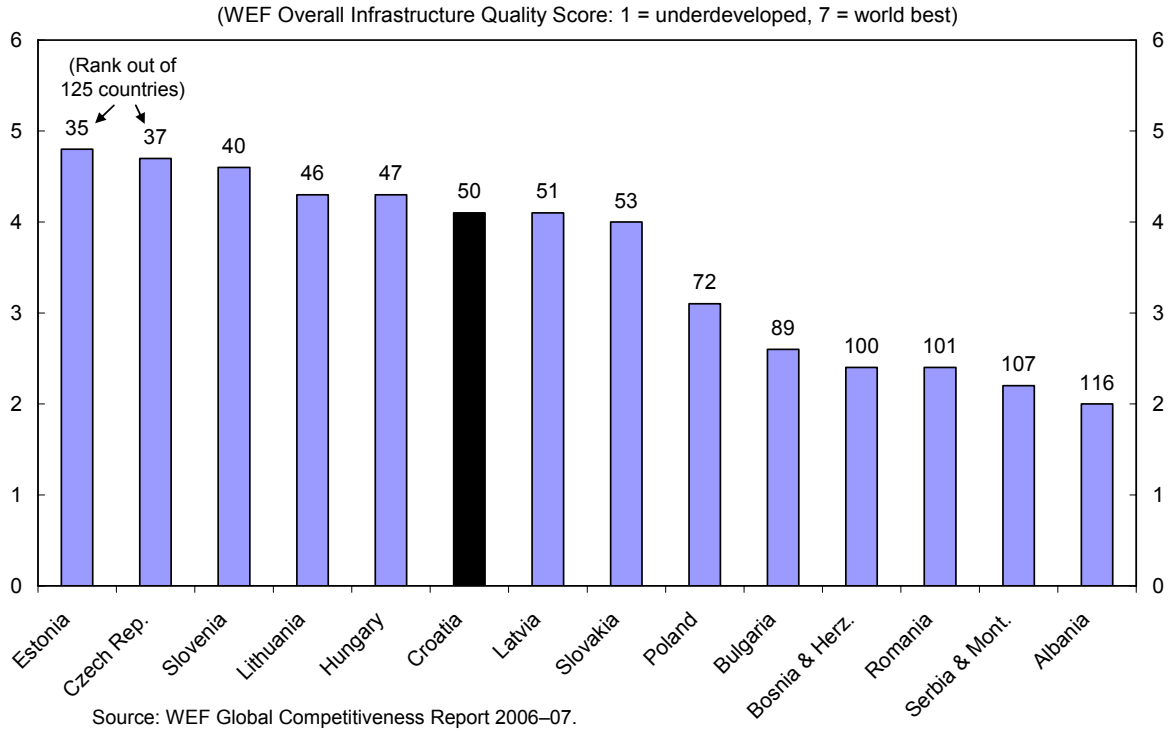
Sources: JP Morgan; and Bloomberg.

Figure II.11. Croatia: Bank Lending Rates, 1999–2006



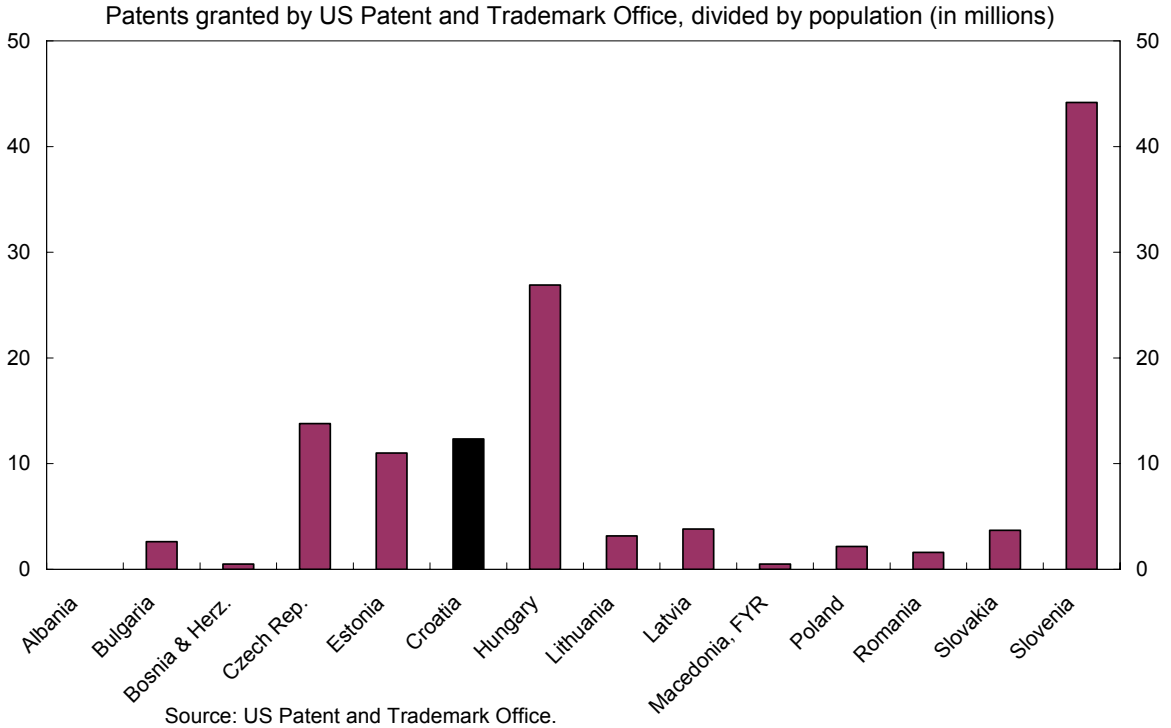
Source: Croatian National Bank.

Figure II.12. Croatia and Selected European Countries: Infrastructure



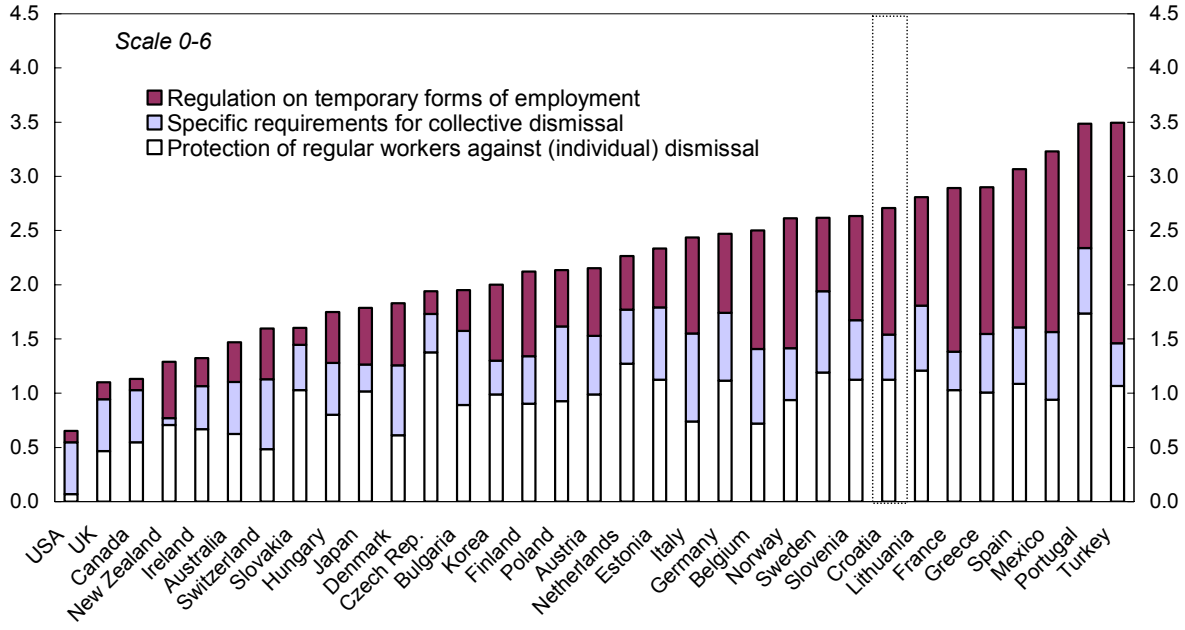
Source: WEF Global Competitiveness Report 2006–07.

Figure II.13. Measuring Innovation, 2001–05



Source: US Patent and Trademark Office.

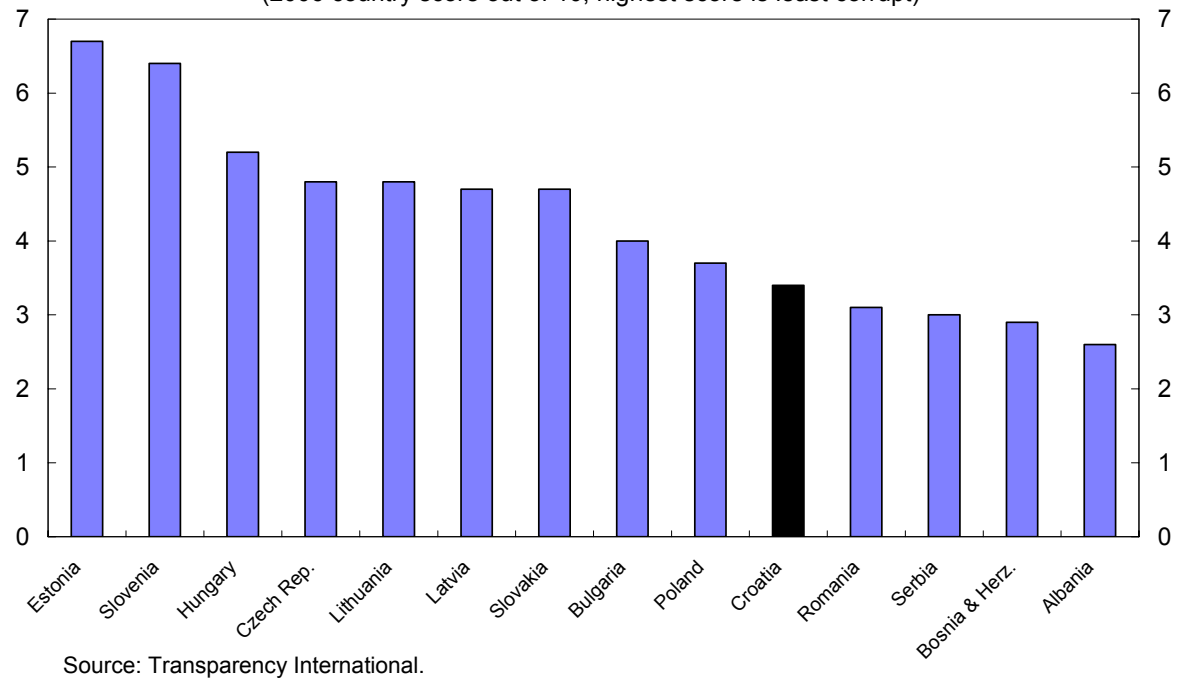
Figure II.14. Employment Protection Legislation, 2003–04



Sources: for Croatia, Tonin (2005) based on the Labor Act as amended up to September 21, 2004.
For Bulgaria, Estonia, Lithuania, and Slovenia, also see Tonin (2005) based on legislation as at 2004.
For OECD countries, see OECD (2006), Figure 3.9; data refer to 2003.

Figure II.15. Corruption Perceptions Index

(2006 country score out of 10, highest score is least corrupt)



Source: Transparency International.

REFERENCES

Aghion, Philippe, and Steven N. Durlauf, 2005, *Handbook of Economic Growth* (North-Holland: Amsterdam).

Barro, Robert, and Xavier Sala-í-Martin, 2004, *Economic Growth*, second edition (New York: McGraw Hill).

Bussière, Matthieu, Jarko Fidrmuc, and Bernd Schnatz, 2005, "Trade Integration of Central and Eastern European Countries: Lessons from a Gravity Model," ECB Working Paper 545, November.

Demekas, Dimitri G., Balázs Horváth, Elina Ribakova, and Yi Wu, 2005, "Foreign Direct Investment in Southeastern Europe: How (and How Much) Can Policies Help?" IMF Working Paper 05/110 (Washington: International Monetary Fund).

European Commission, 2006, *Croatia 2006 Progress Report*, Commission Staff Working Document SEC (2006) 1385 (Brussels: Commission of the European Communities).

Fischer, Stanley, 1993, "The Role of Macroeconomic Factors in Growth", *Journal of Monetary Economics*, Vol. 32, pp. 485–512.

George, Donald A. R., Les Oxley, and Kenneth I. Carlaw, 2004, *Surveys in Economic Growth: Theory and Empirics* (Oxford: Blackwell).

Hausmann, Ricardo, Dani Rodrik, and Andrés Velasco, 2005, "Growth Diagnostics," Working Paper, available at: http://ksghome.harvard.edu/~rhausma/new/growthdiag.pdf

Helpman, Elhanan, 2004, *The Mystery of Economic Growth* (Cambridge, MA: Belknap Press of Harvard University Press).

Hodrick, Robert, and Edward C. Prescott, 1997, "Postwar U.S. Business Cycles: An Empirical Investigation," *Journal of Money, Credit, and Banking*, Vol. 29, No. 1, pp. 1–16.

Institute of Public Finance, 2004, *The Competitiveness of Croatia's Human Resources*, ed. by Bejaković and Lowther (Zagreb: Institute of Public Finance).

Klinger, Bailey, and Daniel Lederman, 2006, "Diversification, Innovation, and Imitation inside the Global Technological Frontier," World Bank Policy Research Working Paper 3872 (Washington: World Bank).

Levine, Ross, and David Renelt, 1992, "A Sensitivity Analysis of Cross-Country Growth Regressions," *American Economic Review*, Vol. 82 (September), pp. 942–63.

OECD, 2006, *OECD Employment Outlook: Boosting Jobs and Incomes* (Paris: Organisation for Economic Co-operation and Development).

Šošić, Vedran, 2004, "Does it Pay to Invest in Education in Croatia? Return to Human Capital Investment as a Factor in Human Resource Competitiveness," in *The Competitiveness of Croatia's Human Resources*, ed. by Bejaković and Lowther (Zagreb: Institute of Public Finance).

Temple, Jonathan, 2000, "Growth Regressions and What the Textbooks Don't Tell You", *Bulletin of Economic Research*, Vol. 52, No. 3, 181–205.

Tonin, Mirco, 2005, "Updated Employment Protection Legislation Indicators for Central and Eastern European Countries," Working Paper, Institute for International Economic Studies, Stockholm University, available at: http://www.iies.su.se/~tonin/mirco_files/MircoToninEPLIndicatorsPaper.pdf.

Vamvakidis, Athanasios, 2006, "External Debt and Economic Reform," IMF Working Paper, forthcoming.

Vujčić, Boris, and Maroje Lang, 2002, "GDN Project Country Study: Croatia" (Global Development Network: Riga).

Appendix. Determinants of Growth: Croatia and the Rest of Europe, 2001–05

	Croatia	SEE 1/	CEE 1/	Euro area	Source
Growth					
Real GDP growth, 2002–05	4.7	4.8	5.8	1.2	WEO
Real GDP per capita growth, PPP adjusted (in percent), 2002–05	6.5	6.8	7.9	2.8	WEO
Total factor productivity growth (in percent), 2002–05	1.6	...	...	-0.4	WEO/staff est.
Convergence					
Real GDP per capita, PPP adjusted, in percent of euro area, 2005	42.7	31.8	53.1	100.0	WEO
Population					
Age dependency ratio, 2004	0.5	0.5	0.4	0.5	WDI
Population growth (in percent), 2002–04	0.0	-0.1	-0.3	0.5	WDI
Investment					
Gross fixed capital formation (in percent of GDP), 2002–05	27.5	21.6	24.3	20.2	WEO
Of which:					
private	20.7	17.0	22.0	...	WEO
public	6.8	4.6	3.5	...	WEO
Gross national saving (in percent of GDP), 2002–05	23.6	19.3	14.5	20.7	WEO
Foreign direct investment, inflows (in percent of GDP), 2002–05	4.8	5.3	5.6	3.5	WEO
Fiscal policy					
General government balance (in percent of GDP), 2005	-4.1	-0.3	-2.5	-2.3	WEO
General government primary balance (in percent of GDP), 2005	-1.8	1.1	-1.0	0.5	WEO
General government, total expenditure and net lending (in percent of GDP), 2005	49.0	38.9	40.5	47.5	WEO
Of which:					
consumption	20.4	19.6	18.0	20.4	WEO
General government, gross debt (in percent of GDP), 2005	44.3	33.7	23.8	70.8	WEO
Tax rates (% of managers surveyed ranking this as a major business constraint), 2002	27.8	28.8	33.2	...	WDI
Monetary policy					
CPI inflation (in percent), 2005	3.3	5.5	3.4	2.2	WEO
Sound money (index, increasing from 1 to 10), 2004	8.1	8.2	9.2	9.6	EFN
Transition					
Average transition (index, increasing from 1 to 5), 2005	3.4	3.0	3.7	...	EBRD
Of which:					
Large scale privatization	3.3	3.2	3.9	...	EBRD
Small scale privatization	4.3	3.7	4.3	...	EBRD
Enterprise restructuring	3.0	2.4	3.4	...	EBRD
Price liberalization	4.0	4.1	4.3	...	EBRD
Competition Policy	2.3	2.0	2.9	...	EBRD
Economic freedom index (index, increasing from 1 to 10), 2004	6.2	5.9	7.1	7.5	EFN
Size of government (index, increasing from 1 to 10), 2004	4.0	4.5	5.7	5.3	EFN
Financial sector development					
M2 (in percent of GDP), 2004	64.5	44.6	45.8	72.9	WDI
M3 (in percent of GDP), 2004	67.0	48.3	48.3	85.0	WDI
Domestic credit to private sector (in percent of GDP), 2004	57.5	28.4	36.0	106.0	WDI
Bank branches (per 100,000 people), 2004	23.4	7.2	12.7	53.1	WDI
Interest rate spread (lending rate minus deposit rate), 2004	9.9	5.6	4.2	4.0	WDI
Banking assets held by government-owned banks (in percent of total banking assets), 2001	5.0	22.8	9.3	2.0	WDI
Banking assets held by foreign-owned banks (in percent of total banking assets), 2001	89.3	52.1	82.2	6.2	WDI
Banking reform & interest rate liberalization (index, increasing from 1 to 5), 2004	4.0	3.0	3.8	...	EBRD
Credit market regulation (index, increasing from 1 to 10), 2004	9.3	7.8	8.3	8.4	EFN
Market capitalization of listed companies (in percent of GDP), 2004	31.9	16.4	27.7	71.6	WDI
Stocks traded, turnover ratio (in percent), 2004	5.9	16.1	32.4	102.0	WDI
Securities markets & non-bank financial institutions (index, increasing from 1 to 5), 2005	2.7	2.0	3.3	...	EBRD
Finance (% of managers surveyed ranking this as a major business constraint), 2002	21.6	24.7	19.9	...	WDI

Determinants of Growth: Croatia and the Rest of Europe, 2001–05 (continued)

	Croatia	SEE 1/	CEE 1/	Euro area	Source
Business environment					
Business regulations (index, increasing from 1 to 10), 2004	5.1	4.7	5.9	6.3	EFN
Starting a new business					
Cost of business start-up procedures (% of GNI per capita), 2004	14.4	19.9	12.6	11.9	WDI
Start-up procedures to register a business (number), 2004	12.0	10.3	8.0	8.0	WDI
Time required to start a business (days), 2004	49.0	44.0	41.6	37.1	WDI
Registration of property					
Procedures to register property (number), 2004	5.0	7.2	5.1	5.4	WDI
Time required to register property (days), 2004	956.0	172.0	79.6	55.7	WDI
Legal system					
Legal system & property rights (index, increasing from 1 to 10), 2004	5.4	4.4	6.0	7.8	EFN
Courts (% of managers surveyed ranking this as a major business constraint), 2002	27.6	21.6	12.6	...	WDI
Corruption (% of managers surveyed ranking this as a major business constraint), 2002	22.5	30.0	15.6	...	WDI
Procedures to enforce a contract (number), 2004	22.0	34.0	25.1	21.6	WDI
Time required to enforce a contract (days), 2004	415.0	501.2	389.0	298.2	WDI
Time to resolve insolvency (years), 2004	3.1	3.7	3.2	1.3	WDI
Infrastructure					
Overall infrastructure reform (index, increasing from 1 to 5), 2005	3.0	2.5	3.2	...	EBRD
Of which:					
Telecommunications	3.3	2.9	3.7	...	EBRD
Railways	2.7	2.8	3.3	...	EBRD
Electric power	3.0	3.0	3.5	...	EBRD
Roads	2.7	2.5	2.6	...	EBRD
Water and waste water	3.3	2.2	3.5	...	EBRD
International trade					
Trade (% of GDP), 2005	102.8	108.0	131.1	73.9	WEO
Trade and foreign exchange system (index, increasing from 1 to 5), 2005	4.3	4.1	4.3	.	EBRD
Freedom to trade internationally (index, increasing from 1 to 10), 2004	6.7	6.6	7.9	8.1	EFN
Human capital					
Illiteracy rate (in percent of population older than 15)	1.9	2.1	0.9	1.6	UNESCO
Primary school enrollment ratio (in percent of relevant age group), 2003	87.3	93.6	90.3	99.4	WDI
Secondary school enrollment ratio (in percent of relevant age group), 2003	85.0	84.6	90.1	92.2	WDI
Public spending on education (in percent of GDP), 2002	4.5	3.9	5.3	5.1	WDI
Expenditure per student, primary (in percent of GDP per capita), 2002	24.0	14.4	18.3	18.3	WDI
Expenditure per student, secondary (in percent of GDP per capita), 2002	23.5	13.4	22.5	26.3	WDI
Labor force with primary education (in percent of total), 2001	20.1	25.0	14.0	33.2	WDI
Labor force with secondary education (in percent of total), 2001	60.4	58.1	64.6	44.2	WDI
Labor force with tertiary education (in percent of total), 2001	17.2	16.3	21.3	21.9	WDI
Labor skills (percent of managers surveyed ranking this as a major business constraint), 2002	8.7	8.0	12.9	...	WDI
Labor market					
Unemployment rate (in percent), 2005	12.7	19.8	10.6	8.6	WEO
Long-term unemployment (in percent of total unemployment), 2002	56.4	...	50.9	43.1	WDI
Youth unemployment rate (in percent of relevant age group) , 2002	36.9	32.4	24.5	17.3	WDI
Labor force participation rate (in percent), 2004	65.5	67.4	68.2	69.8	WDI
Rigidity of employment index (0=less rigid to 100=more rigid), 2004	57.0	43.5	35.1	49.1	WDI
Labor regulations (percent of managers surveyed ranking this as a major business constraint), 2002	5.4	6.6	8.6	...	WDI
Labor market regulations (index, increasing from 1 to 10), 2004	5.5	5.6	5.8	5.1	EFN

Determinants of Growth: Croatia and the Rest of Europe, 2001–05 (continued)

	Croatia	SEE 1/	CEE 1/	Euro area	Source
Health					
Life expectancy at birth, total (years), 2004	75.4	73.7	73.1	79.4	WDI
Mortality rate, infant (per 1,000 live births), 2004	6.3	12.7	6.7	4.1	WDI
Health expenditure per capita (current US$), 2003	494	336	440	2,552	WDI
Health expenditure, total (in percent of GDP), 2003	7.8	7.6	6.7	9.6	WDI
Of which:					
private	1.3	2.9	1.7	2.5	WDI
public	6.5	4.7	5.0	7.1	WDI
Hospital beds (per 1,000 people), 2003	5.6	4.8	8.1	6.6	WDI
Physicians (per 1,000 people), 2003	2.4	2.3	3.2	3.5	WDI
New economy					
Research and development expenditure (in percent of GDP), 2003	1.1	0.5	0.8	2.2	WDI
High-technology exports (in percent of manufactured exports), 2004	13.0	3.1	10.5	16.3	WDI
Personal computers (per 1,000 people), 2004	189.5	148.5	309.6	420.8	WDI
Mobile phone subscribers (per 1,000 people), 2004	639.8	524.1	844.0	904.2	WDI
Internet users (per 1,000 people), 2004	293.3	187.8	360.6	443.2	WDI
Price basket for Internet (US$ per month), 2003	17.1	19.8	24.7	22.5	WDI

Sources: IMF World Economic Outlook (WEO); World Bank World Development Indicators (WDI); European Bank of Reconstruction and Development (EBRD); Economic Freedom Network (EFN).

1/ For the purposes of this comparison, SEE countries include Albania, Bosnia and Herzegovina, Bulgaria, FYR Macedonia, Romania, Serbia and Montenegro, and Slovenia. CEE countries include Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, and the Slovak Republic.

III. Economic Effects of Reducing the Size of the Government in Croatia: A Note Based on the IMF's Global Fiscal Model[1]

A. Introduction

1. **In Croatia, the government redistributes a larger share of GDP than in peer countries in central and eastern Europe (Figure III.1).** This large redistribution is a burden on growth, as the required heavy taxation causes significant distortions between pre- and after-tax returns on factors of production, and thus impedes incentives to work and invest. Moreover, the sizable and generally inflexible expenditure hampers fiscal policy's ability to manage domestic demand.

2. **Recognizing the problem, the authorities aim to reduce the size of the general government budget and its deficit, as envisaged in their 2007 budget law and medium-term fiscal framework.[2]** Over 2007–2009, the envisaged reduction in revenue and expenditure is 1.7 and 2.1 percentage points of GDP, respectively, thus cutting the deficit by 0.4 percentage points of GDP in an effort to lean against private demand pressures and mitigate the rise in the current account deficit.

3. **A mounting body of theoretical and empirical literature suggests that a strategy of lasting fiscal adjustment accompanied by cuts of direct taxes would encourage, under certain conditions, growth in the medium term.[3]** The adjustment is more likely to be successful if it is based on cuts in the government wage bill and transfers, accompanied by permanent changes in entitlements. Putting public debt on a sustainable path, such an adjustment stimulates growth both by creating fiscal space for cuts in taxes on capital and labor (which improve incentives to invest and work) and by inducing favorable expectations about medium-term tax policy and interest rates. For example, the EU-15 countries underwent significant fiscal consolidation in the 1990s, reducing their budget deficit by 4.2 percentage points of GDP on average. Though other factors surely affected their economies, the average GDP growth of the EU-15 increased from 1.5 percent in 1992–1997 (before and during fiscal consolidation) to 2.7 percent in 1997–1999.

4. **This note analyzes the likely economic effects of further expenditure-based fiscal consolidation in Croatia as envisaged by the authorities, with the help of the IMF's Global Fiscal Model**. Motivated by the large excess of Croatia's revenue and expenditure over those of its peers in central and eastern Europe, as well as by the need to significantly reduce the budget deficit for a number of reasons described in the staff report for the 2006

---

[1] Prepared by Nikolay Gueorguiev.

[2] Republic of Croatia, *Economic and Fiscal Policy Guidelines for the period 2000–2009*, Zagreb, July 2006.

[3] A partial list includes Bertola and Drazen (1993), Alesina et al. (1995, 1998, 2002), and von Hagen (2001).

Article IV consultation, the note also analyzes an alternative package, involving deeper expenditure and tax cuts and a lower deficit.

B. Methodology

5. **The Global Fiscal Model (GFM) is a general equilibrium dynamic model, which includes consumers, firms, and a government.**[4] The optimizing behavior of consumers and firms subject to their budget constraints generates demand for consumption, investment, and labor. The government collects taxes and spends the proceeds to purchase goods and services or transfers part of them back to the consumers. The model contains a number of empirically relevant features that induce real effects of fiscal policy—finite planning horizons, liquidity-constrained as well as forward-looking consumers, and distortionary capital and labor taxation that affect capital accumulation and labor supply. The model is calibrated to match, to the extent possible, Croatia's projected national account and fiscal data for 2006. *Its results should be viewed as indicating the direction of change and possible order of magnitude of the effects spurred by the tax and expenditure cuts rather than their precise quantification*.

6. **The scenarios run with the model are:**

a. A reduction of budget revenue by 1.7 percentage points of GDP and expenditure by 2.1 percentage points of GDP over 2007–2009, split between absorption and transfers as envisaged in the 2007 budget law and *Economic and Fiscal Policy Guidelines for the period 2007–2009*. These policies set in motion dynamics that lead to a long-run equilibrium in which revenue and expenditure are lower than their 2006 values by 2.5 and 3.1 percentage points of GDP, respectively (Table III.1).[5] This scenario is called the "baseline scenario" in the rest of this chapter.

b. A more ambitious expenditure reduction of 4.3 percentage points of GDP over 2007–2012, so that the ratio of expenditure to GDP roughly halves the distance to the average for 10 EU New Member States (Figure III.1). This is accompanied by gradual revenue reduction of 2.5 percent of GDP over the same period, with a view to cut the deficit to 1.5 percent of GDP in 2009 and 1 percent of GDP in 2012. Thereafter, revenue and expenditure continue their gradual decline, reaching a long-run equilibrium around 40 percent of GDP each, broadly in line with the average for Croatia's peers in central and eastern Europe (Table III.1 and Figure III.1). This scenario is labeled the "ambitious scenario" thereafter.

---

[4] The model is described in detail in Botman et al. (2006), and Botman and Kumar (2006).

[5] The long-run equilibrium (steady state) fiscal values are determined by the new steady state government debt level, set according to the condition of "smooth transition", i.e., that no large endogenous revenue jump occurs at the points where policy guidance ceases (2010 and 2013 for each scenario, respectively).

Table III.1. Budget Revenue, Expenditure, and Balance Under The Two Scenarios

	2006 Est.	2007 Budget	2008	2009	2012	Long Run 1/
Baseline Scenario						
Revenue	45.0	44.8	44.0	43.3	...	42.5
Expenditure	47.8	47.6	46.6	45.7	...	44.7
Balance	-2.8	-2.8	-2.6	-2.4	...	-2.2
Ambitious Scenario						
Revenue	45.0	44.8	44.3	43.8	42.5	39.8
Expenditure	47.8	47.6	46.3	45.3	43.5	40.2
Balance	-2.8	-2.8	-2.0	-1.5	-1.0	-0.4

Sources: Republic of Croatia, *2006 Pre-Accession Economic Program* and *Economic and Fiscal Policy Guidelines for the period 2007–2009*; and Fund staff projections.

1/ As implied by the model; see footnote 5.

7. **To analyze the responsiveness of the economy to different tax cuts, three potential tax-cutting policies** are **examined for each of the scenarios outlined above:**

- A cut in direct income taxes (corporate and personal income taxes);
- A cut in social security contributions;
- A cut in consumption taxes (VAT is assumed for simplicity).

The tax and expenditure cuts are phased in annually according to the authorities' and staff's projections for 2007–2009 and 2007–2012, respectively.[6]

C. Results

8. **The baseline scenario following the authorities' medium-term framework delivers positive but modest results (Table III.2 and Figures III.2–III.4).** In the long run, GDP rises by ¼–2¾ percent relative to the no-change baseline, consumption increases by 2–3 percent, and investment improves by up to 6½ percent. The current account deficit is reduced by ½–1½ percentage points of GDP.

[6] The authorities' framework does not explicitly envisage tax cuts; thus, the analysis is hypothetical, assuming that the projected revenue decline stems from tax policy changes. Moreover, the authorities' scenario may soon evolve, as they indicated support for a more ambitious expenditure-led fiscal consolidation, along the lines suggested by staff, in the discussions for the 2006 Article IV consultation.

9. **Turning first to cuts in direct income taxes, both GDP and aggregate consumption are higher by close to 3 percent in the long run relative to the no-change baseline (Figure III.2).** This is largely the result of an investment pick-up as the after-tax return on capital improves owing to the cut in the corporate income tax. Moreover, this investment expansion raises the demand for labor as well, and thus lifts the real wage. The cut in the personal income tax contributes to the consumption rise by increasing the consumers' disposable income; however, its effect on labor supply is minor owing to the latter's generally low price elasticity. As the cut in government expenditure falls entirely on nontradables, the real exchange rate depreciates and output of tradables increases faster than that of nontradables, leading to an initial improvement in the trade balance; later, the rise in consumption and investment pushes it back. Nevertheless, the current account improves by about 1½ percent of GDP, as both the initial trade balance improvement and the falling government debt cause a rise in the economy's net foreign assets and thus cut its interest rate bill, which more than offsets the gradual and modest subsequent decline in the trade balance.

Table III.2. Comparison of Long-Run Economic Effects Between the Two Scenarios
(In percent of the initial steady state)

	Income Taxes		Social Security		VAT	
	baseline	ambitious	baseline	ambitious	baseline	ambitious
Improvement in:						
GDP	2.8	6.0	1.1	2.3	0.3	0.6
Consumption	3.0	7.4	3.1	7.5	2.3	5.9
Investment	6.6	14.7	1.2	2.6	0.4	0.9
Current Account	1.5	4.4	0.6	2.3	0.6	2.5
Real Wage	3.1	6.9	4.5	12.4	-0.2	-0.2

Source: Fund staff calculations.

10. **While cutting social security contributions appears to produce more moderate benefits in terms of GDP growth and external adjustment, but a somewhat higher response by the real wage and consumption, the response of output and exports to the social security contribution cuts may be understated (Figure III.3).**

- Investment now rises only a little, as it benefits solely from the slightly depreciating real exchange rate and the lower labor cost to firms; correspondingly, GDP rises by a modest 1 percent over the long run. The gains in investment and GDP are not as pronounced as in the case of a corporate income tax cut because the elasticity of labor supply to labor tax cuts is small relative to investment's sensitivity to the after-tax return on capital, a common feature of models of this type. However, as the wedge between the pre- and after-tax cost of labor declines, employers demand more labor, which, given the limited supply response, raises the real wage and consumption by

more than in the previous case. The trade balance and current account improvements are moderate, reaching less than half of the gains in the corporate income tax cut case. This is because the more modest real exchange rate depreciation (to which investment in tradables is very sensitive) results in a more modest increase in investment and output of tradables as well.

- In the model, output growth is constrained by the limited availability of additional labor to satisfy the strong rise in labor demand reacting to the reduced labor costs. In reality, however, the effective labor supply increase could be significantly stronger than predicted by the model on account of the large available pool of unemployed (12 percent of the labor force by mid-2006), who could be rapidly employed should the costs of labor fall sufficiently. As the model starts from a full-employment equilibrium, it does not capture this likely effect.
- By reducing labor costs, a cut in social security contributions also improves the external competitiveness in the economy and thus could be expected to provide a boost to exports. However, model simulations do not fully reflect this effect.

11. **Finally, the cut in VAT is disappointing (Figure III.4).** Investment hugs the baseline, as the return on capital does not improve directly. Moreover, as the direct cost of labor does not drop either, there is no pick-up in labor demand, and the increase in labor supply (spurred by the higher return on labor in terms of consumption owing to falling prices of goods and services) mostly serves to depress the real wage. GDP stays close to the baseline as well. Consumption still rises, though, as the price reduction stemming from the VAT cut is larger than the decline in the real wage. The trade balance and the current account improve about as much as in the social security contribution cut case.

12. **The more ambitious scenario of revenue and expenditure reduction based on staff recommendations shows some notable differences (Table III.2 and Figures III.5–III.7).** ***First,*** the deeper tax cuts—leaving in the long run twice as much funds with the private sector as under the authorities' scenario—generally translate into at least double-sized benefits in terms of GDP, consumption, investment and the real wage. ***Second***, the even larger reduction in government expenditure associated with the lower deficit targets provides for correspondingly larger and faster improvements in the trade balance and the current account. ***Third,*** these improvements in the external accounts come at the cost of somewhat larger initial drop in the consumption of liquidity-constrained consumers, owing to the larger cuts in budget transfers. The ongoing trend of rapidly rising credit to households would reduce the share of the liquidity-constrained consumers and thus alleviate this effect.

D. Policy Implications and Concluding Remarks

13. **The analysis suggests a number of benefits stemming from a strategy of cutting taxes and expenditure while also reducing the deficit.** Such a strategy would raise the private benefit of producing and working and thus stimulate investment and labor supply,

leading to higher output and consumption. At the same time, it would also mitigate the macroeconomic vulnerabilities in the economy, in particular those stemming from the rising current account deficit.

14. **The revenue and expenditure paths in the authorities' current medium-term fiscal framework imply positive but moderate effects relative to their macroeconomic targets.** A more ambitious but still feasible expenditure reduction of about double the envisaged size over five years would provide room for both deeper tax cuts and lower budget deficit. Such a package would at least double the benefits in terms of growth, consumption, and improvement in external accounts, bringing the economy closer to the ambitious macroeconomic objectives envisaged in the government's *Strategic Development Framework 2006–2013*.

15. **This note finds that a cut in consumption taxes fares the worst in terms of investment, GDP growth, and external accounts improvement.** A revenue-equivalent cut in direct income taxes, especially the corporate income tax, delivers large benefits, while a reduction in social security contributions falls in between (producing, however, the strongest improvement in the real wage and consumption). Two main reasons explain this ranking. First, owing to its easy mobility, capital (investment) is much more sensitive to changes in its after-tax return relative to labor supply. However, in discussions with staff, employers did not see the effective corporate tax burden as particularly high, and it apparently has not been impeding investment (which has been growing strongly since mid-2005).[7] Second, consumption tax cuts affect production only indirectly through increasing demand without directly affecting the returns and costs of capital and labor.

16. **Cutting social security contribution rates may prove more beneficial than it appears at first sight.** The output response to such cuts may be underestimated, as the model does not take into account the additional increase in labor input from a likely decline in the high unemployment rate once labor costs are cut. Moreover, unit labor costs have risen since 2000 relative to a number of competitors in central Europe (Figure 4 of the accompanying staff report). In view of the limited room for exchange rate flexibility, cuts in social security contributions could thus strengthen external competitiveness in addition to stimulating employment. Ongoing pension and health reforms should be among the measures providing the offsetting expenditure reduction to keep the deficit on the targeted path.

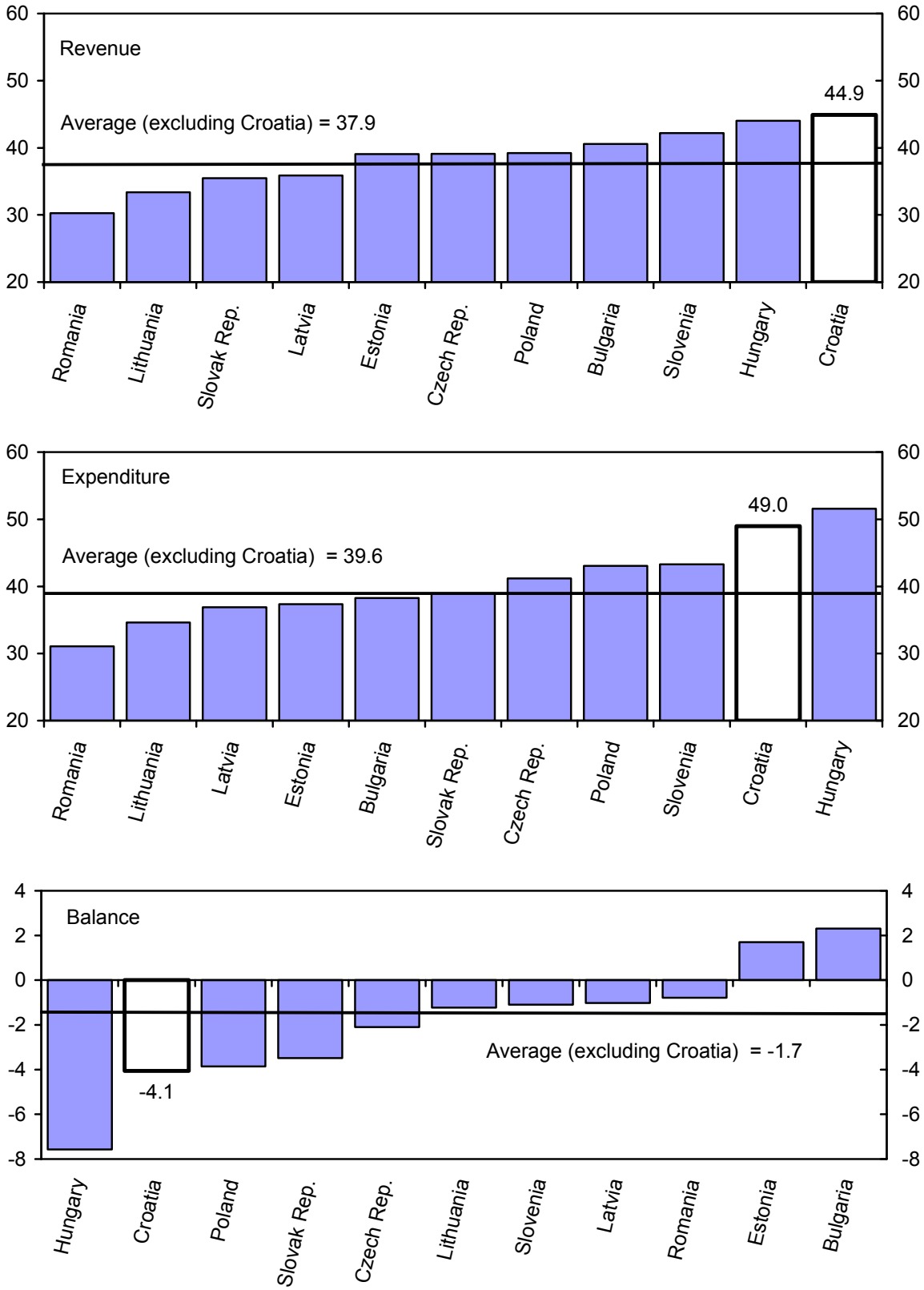
17. **While the relationship between fiscal policy and growth is far from clear-cut, there is some reason to believe that the analysis above may understate the benefits of fiscal adjustment.** To the extent that fiscal consolidation is perceived as credible and lasting—reinforced, for example, by a realistic and transparent medium-term strategy—

[7] Švaljek et al. (2006) found that Croatia's effective corporate income tax burden compares favorably to that of 19 OECD countries, mostly owing to accelerated asset depreciation and untaxed dividends.

confidence effects can emerge which, while difficult to capture in the model, can certainly be a plus for investment and other components of growth, even in the short run. To ensure that growth is sustainable, fiscal policy over the medium term needs to safeguard public debt and external sustainability. In this regard, rising public and external debt ratios and large current account deficits have been found to increase a country's vulnerability to crisis. Thus, the benefits associated with the policy alternatives studied in this paper also include obtaining some insurance against crisis, though the model does not take this into account.

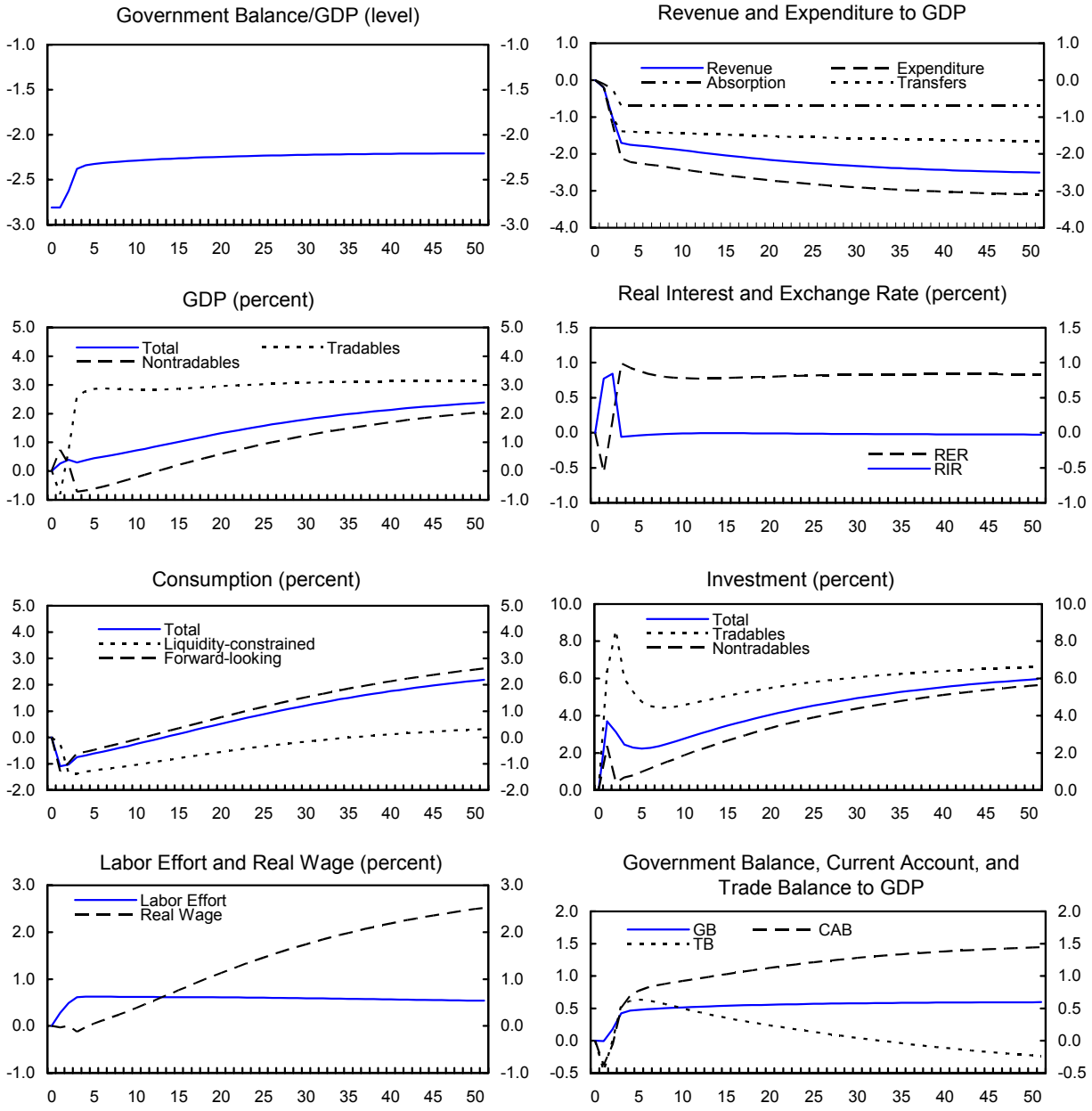
Figure III.1. General Government Accounts, 2005
(In percent of GDP)

The government in Croatia is large relative to its regional peers.



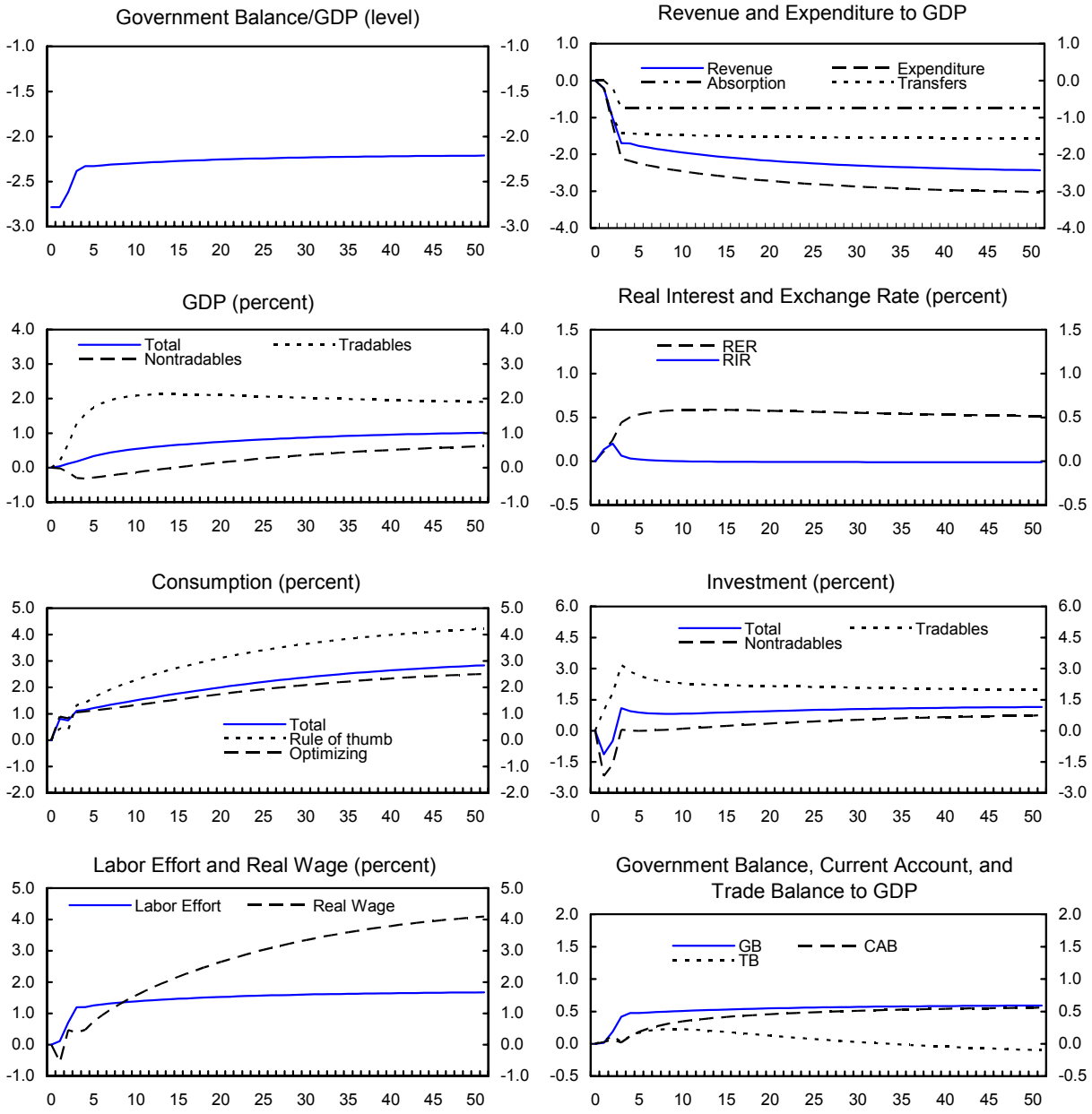
Source: WEO.

Figure III.2. Croatia: Corporate and Personal Income Tax Cuts, Baseline Scenario
Deviations from steady state, unless stated otherwise
(In percent or percentage points of GDP, as indicated)



Source: Fund staff simulations.

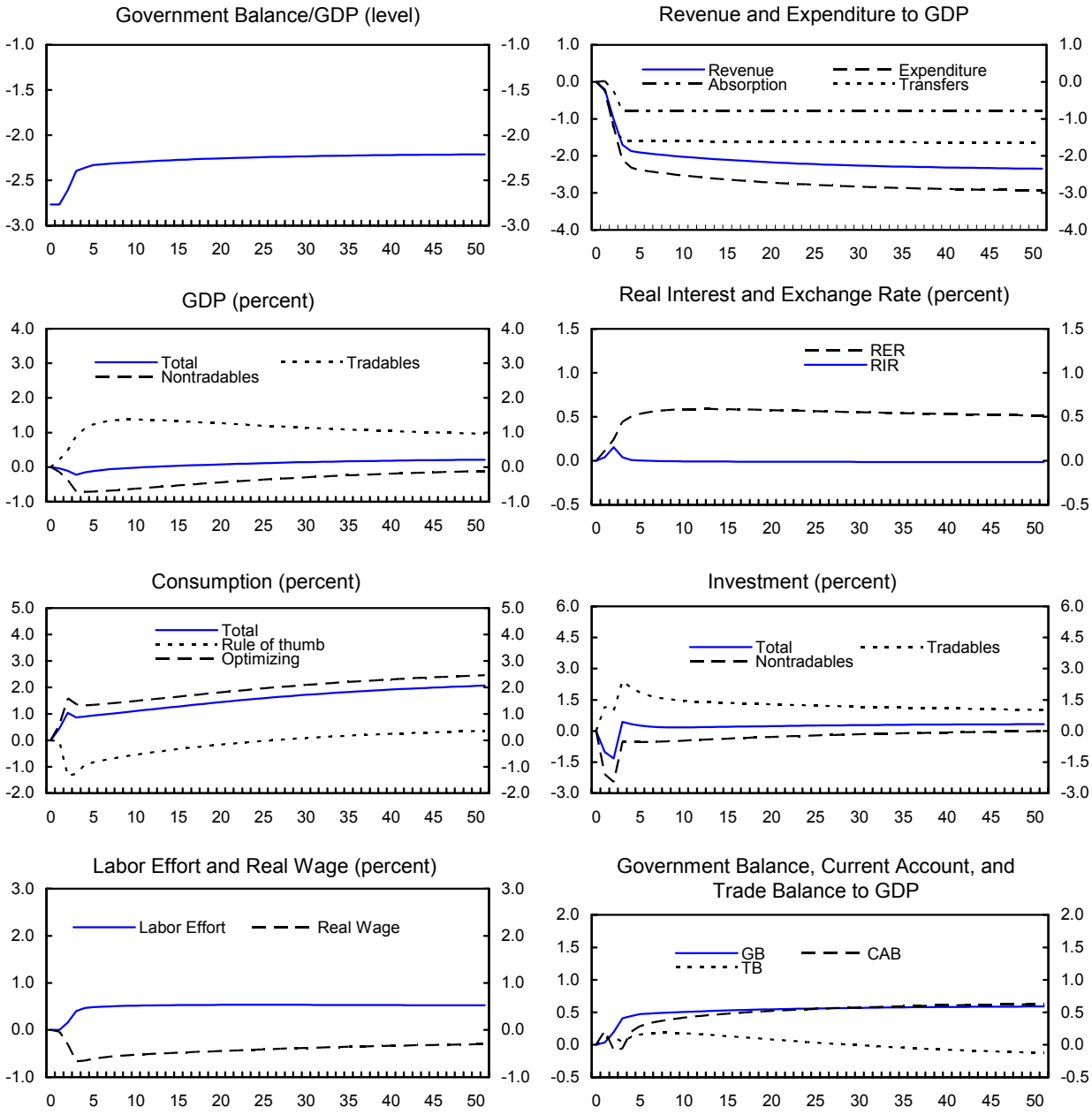
Figure III.3. Croatia: A Cut in Social Security Contributions, Baseline Scenario
Deviations from steady state, unless stated otherwise
(In percent or percentage points of GDP, as indicated)



Source: Fund staff simulations.

Figure III.4. Croatia: A VAT Cut, Baseline Scenario

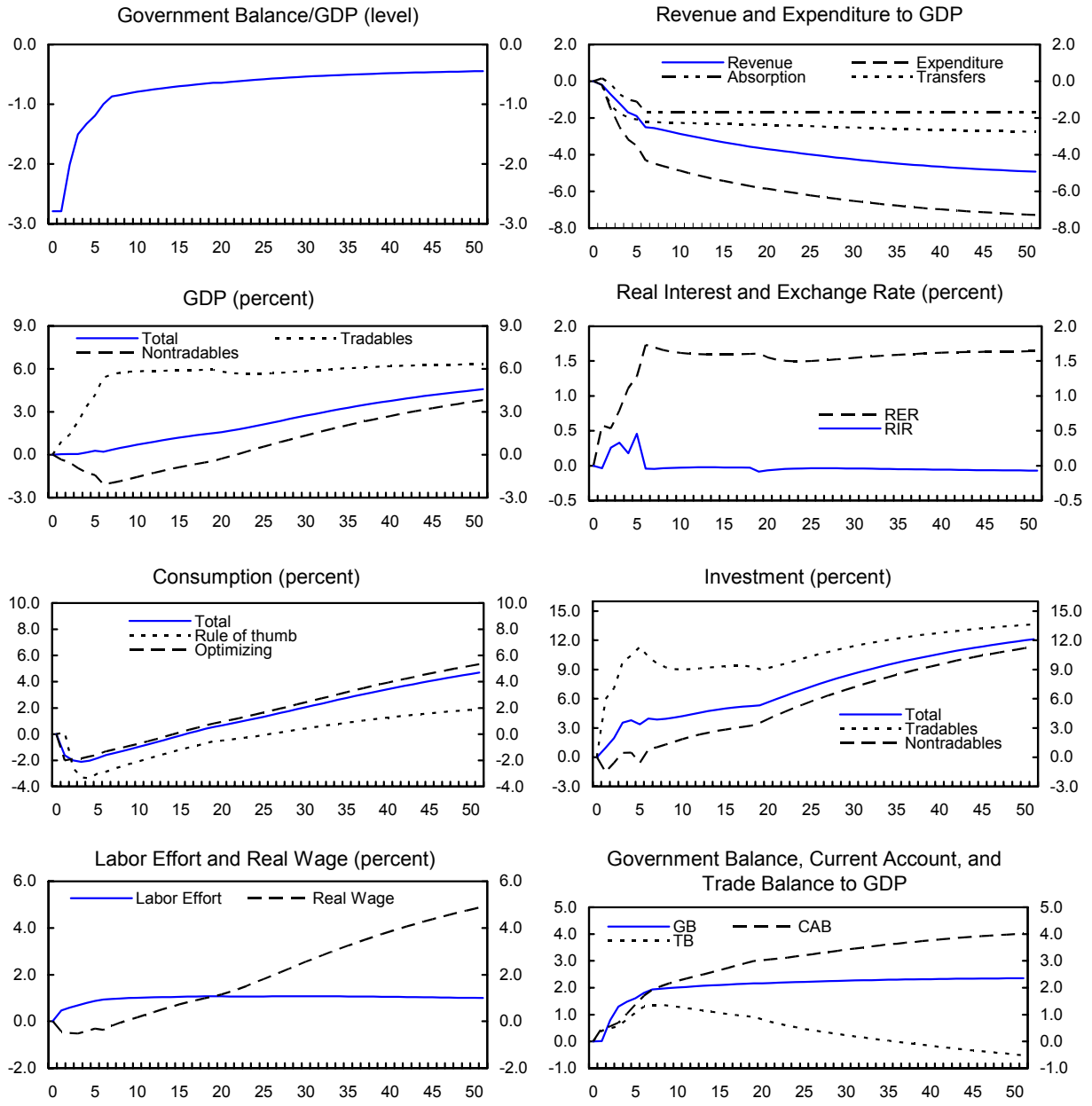
Deviations from steady state, unless stated otherwise
(In percent or percentage points of GDP, as indicated)



Source: Fund staff simulations.

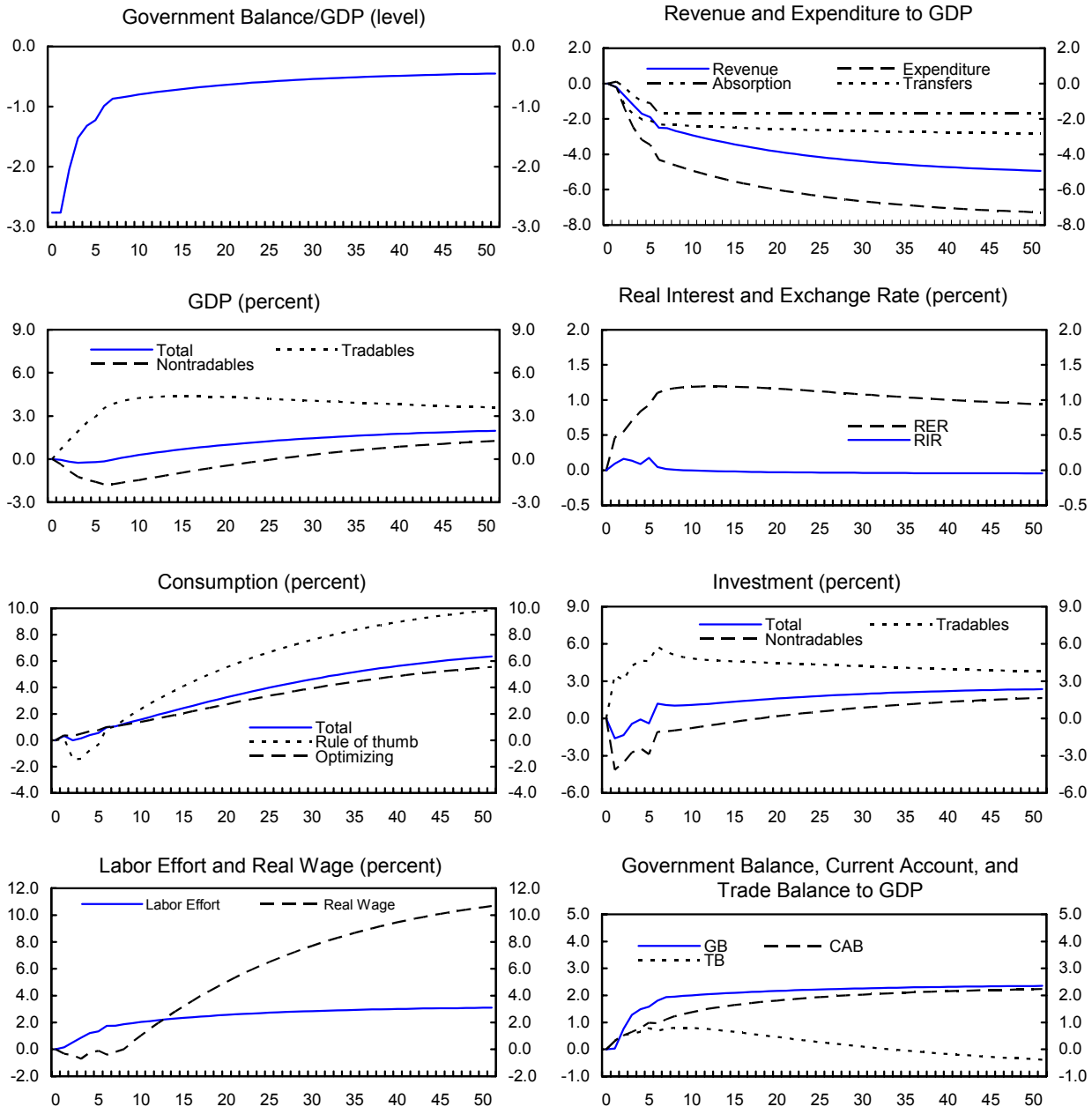
Figure III.5. Croatia: Corporate and Personal Income Tax Cuts, Ambitious Scenario

Deviations from steady state, unless stated otherwise
(In percent or percentage points of GDP, as indicated)



Source: Fund staff simulations.

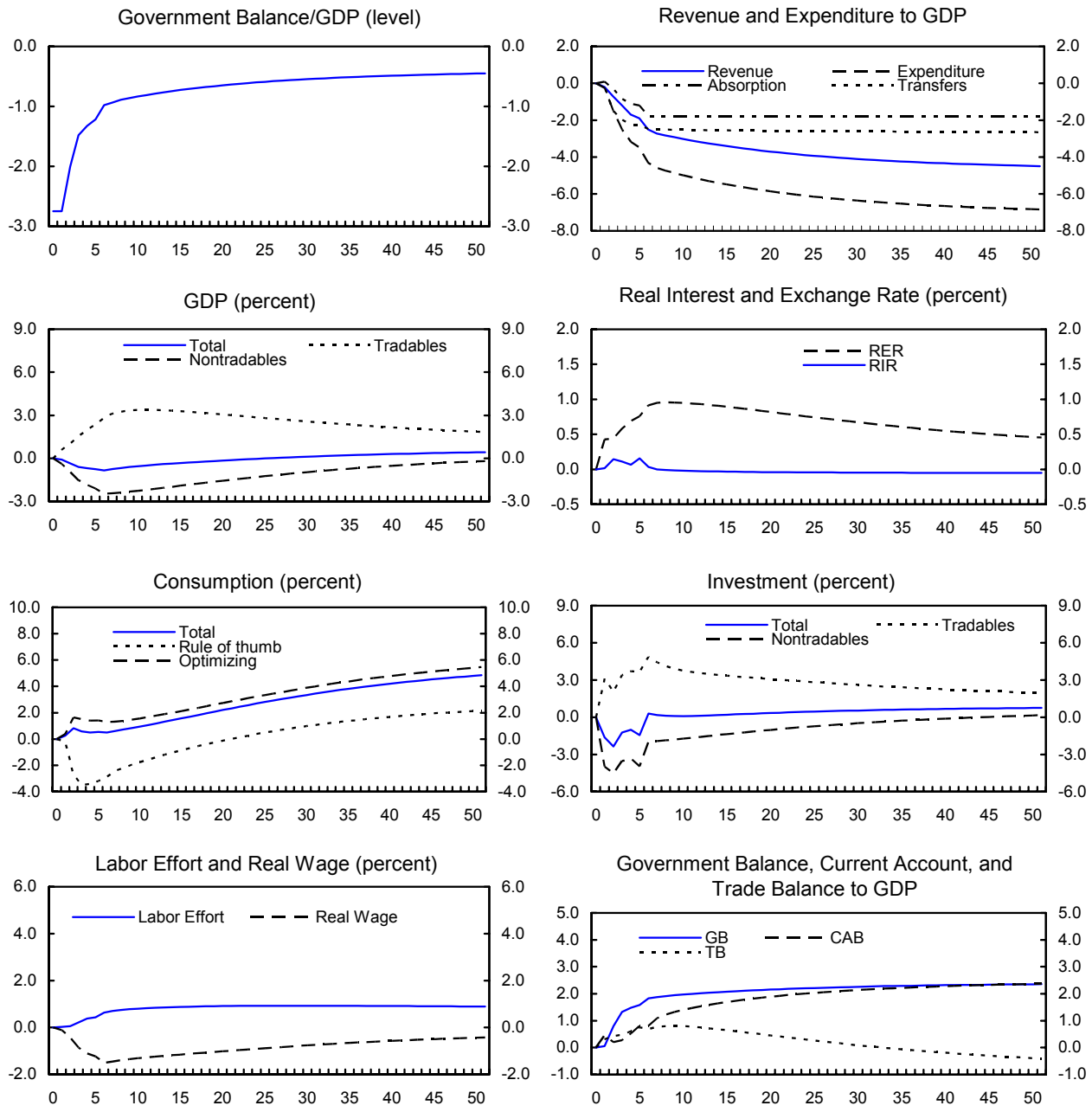
Figure III.6. Croatia: A Cut in Social Security Contributions, Ambitious Scenario
Deviations from steady state, unless stated otherwise
(In percent or percentage points of GDP, as indicated)



Source: Fund staff simulations.

Figure III.7. Croatia: A VAT Cut, Ambitious Scenario

Deviation from steady state, unless stated otherwise
(In percent or percentage points of GDP, as indicated)



Source: Fund staff simulations.

REFERENCES

Alesina, Alberto, and Roberto Perotti, 1995, "Fiscal Expansion and Adjustments in OECD Countries," *Economic Policy*, Vol. 10, No. 21, pp. 205–248.

Alesina, Alberto, and Silvia Ardagna, 1998, "Tales of Fiscal Adjustment," *Economic Policy*, Vol. 13, No. 27, pp. 487-545.

Alesina, Alberto, Silvia Ardagna, Roberto Perotti, and Fabio Schiantarelli, 2002, "Fiscal Policy, Profits, and Investment," *American Economic Review*, Vol. 92, No. 3, pp. 571–589.

Bertola, Giuseppe, and Allan Drazen, 1993, "Trigger points and budget cuts: explaining the effects of fiscal austerity," *American Economic Review*, Vol. 83, No. 1, pp. 11–26.

Botman, Dennis, Douglas Laxton, Dirk Muir, and Andrei Romanov, 2006, "A New-Open-Economy-Macro Model for Fiscal Policy Evaluation," IMF Working Paper 06/45 (Washington: International Monetary Fund).

Botman, Dennis, and Manmohan Kumar, 2006, "Fundamental Determinants of the Effects of Fiscal Policy," IMF Working Paper 06/72 (Washington: International Monetary Fund).

Švaljek, Sandra, Alexander Klemm, Nenad Kukić, Danijel Nestić, and Sunčana Slijepčević, 2006, "Effective Tax Burden on Companies in Croatia" (in Croatian), Economic Institute of Zagreb, Zagreb, Croatia. An English-language summary is available at: http://www.eizg.hr/AdminLite/FCKeditor/UserFiles/File/summary-etr.pdf.

Von Hagen, Jurgen, Andrew Hughes Hallett, and Rolf Strauch, 2001, "Budgetary Consolidation in EMU," CEPR Economic Papers No. 148, March.

IV. External Debt and Balance-Sheet Vulnerabilities in Croatia[1]

A. Introduction

1. **In the past six years, Croatia's external debt jumped by over 25 percent of GDP to reach around 86 percent of GDP at end-2006.** Alarm bells are somewhat muted by Croatia's solid economic performance, continued access to international capital markets and expectations of upcoming membership in the European Union. Still, the comment by Deutsche Bank (2005) perhaps best sums up the nagging concerns of outsiders—"*Croatia's true Achilles heel is external debt...more worrying than the amount of debt, however, is the speed of its increase."*[2] Croatian policymakers have also paid increasing attention to external debt, cutting back on public foreign borrowing and discouraging external borrowing by the private financial sector.

2. **This chapter explores how intersectoral vulnerabilities have shifted with the surge in external debt.** To date, much of the discussion on the burgeoning debt has focused on Croatia's aggregate position with respect to the rest of the world, with less attention paid to differences across domestic sectors and to intersectoral linkages. A more formal analysis of the balance-sheet related vulnerabilities of Croatia's main economic sectors is one of the central themes of this Article IV consultation, and is the main subject of this paper.[3]

3. **The rest of the chapter is organized as follows**. Section B describes Croatia's external debt dynamics and associated risks. Section C introduces the Balance-Sheet Approach (BSA), describes the construction of the balance-sheet matrices for Croatia and analyzes net financial positions at the aggregate and sectoral levels. Section D presents the sensitivity analysis of the private sector's balance-sheet to the debt rollover, interest and exchange rate shocks. Section E concludes with a discussion of policies to mitigate the balance-sheet related vulnerabilities.

B. Croatia's External Debt

4. **Croatia has had roughly a decade of access to international capital markets.** In its first few years of independence, Croatia's main priorities were rebuilding its economy after the war and regularizing its relations with foreign creditors. Following the Paris Club rescheduling in 1995, Croatia received its first international credit rating (investment grade) and launched its first Eurobond in early 1997. A succession of programs with the IMF helped

---

[1] Prepared by Alvin Hilaire and Anna Ilyina.

[2] Such sentiments were echoed in the European Union Transition Report (2005) *"...the high level of external indebtedness...pose[s] a major risk to future growth..."* and the International Monetary Fund (2004)*" [the] rising external debt-to-GDP ratio..[has] increased significantly Croatia's external vulnerability."*

[3] Other studies on Croatia's external debt include Babic et al (2004) and Mihaljek (2004).

to frame economic policies and facilitated access to capital markets, rather than serving as a source of balance of payments support—of SDR 1.1 billion potentially available from the Fund, Croatia drew only SDR 58 million. Achieving milestones along the route to European Union accession also served to bolster market confidence.[4]

5. **Large financing needs, including for economic reconstruction, prompted heavy external borrowing by the public sector and, subsequently, by the private sector**. The initial tapping of foreign markets by the public sector was vigorous, as reflected in the steep rise of public debt from 17 to 29 percent of GDP during 1998–2000. During the same period, the private sector's external borrowing was relatively stagnant. However, the situation changed dramatically over the next years, with the public external debt-to-GDP ratio drifting below the peak of 2000 and the private sector's external debt shooting up to over 60 percent from 33 percent of GDP, led by commercial bank borrowing.

6. **Concerns about the rapid increase in external borrowing prompted the authorities to take action**. The slowdown in public external debt accumulation, in part, reflected a deliberate policy to reduce the government's reliance on external financing. In an effort to slow private sector borrowing from abroad, the central bank adopted a number of measures (with prudential considerations in mind, see Table IV.5, Appendix II) aimed at increasing the cost of external funding. For example, banks were required to deposit, without remuneration, a progressively larger proportion of borrowed funds at the central bank. However, since 2000, steps have not been taken to directly limit external borrowing of the non-financial private sector.

7. **The level and dynamics of Croatia's external debt raises a number of red flags**. In general, high levels of external debt and debt service burden raise concerns about current account and external debt sustainability. Sensitivity analysis of external debt dynamics to plausible but low-probability adverse events—current account, interest rate and real exchange rate shocks—show that external debt ratio can shoot up to 90–100 percent of GDP.[5] Moreover, high level of short-term external debt (by remaining maturity) exposes a country to debt-rollover risk in the event of a "sudden stop" in capital flows. Finally, heightened debt sustainability and debt rollover concerns tend to raise the cost of external borrowing and may ultimately increase the likelihood of a balance of payment crisis.[6]

8. **A review of key lessons from past balance of payment crises suggests that certain combinations of macroeconomic and financial imbalances, as well as rigidities in the policy framework, tend to increase the likelihood and severity of crises**. In recent

[4] Standard and Poor's related its upgrade of Croatia's foreign currency sovereign rating in late 2004 directly to the likely start of EU candidacy talks.

[5] See Staff report, Appendix IV.

[6] See, for example, Calvo et al (2004), Berg et al (2004).

emerging market crisis episodes, countries that turned out to be most vulnerable to external shocks typically had inflexible exchange rate regimes, current account and/or fiscal deficits and balance-sheet weaknesses in the private and/or public sectors. Despite its stable macroeconomic performance in recent years, Croatia seems to have many of these features: the exchange rate is fairly inflexible, fiscal policy is not all that nimble, the current account deficit is persistent (above 5 percent of GDP) and the fiscal balance remains in deficit (now close to 3 percent of GDP). The external debt-to-GDP ratio is high (well over 80 percent of GDP), and continues to rise on the back of private sector borrowing. All of the above underscores the importance of having reliable information on the balance-sheet positions of Croatia's main economic sectors, which would help to identify potential pressure points and risk transmission mechanisms in the event of a negative shock.

C. The Application of the Balance-Sheet Approach to Croatia

9. **The balance-sheet approach (BSA) is a way to analyze the economy as a system of interlinked sectoral balance sheets.** While traditional macroeconomic analysis is typically concerned with aggregate *flow variables* (such as fiscal and current account balances), the balance sheet approach focuses on *stocks* (such as asset and liability positions).[7] Clearly, the two approaches are interrelated. Typically, the starting point in the BSA is the construction of detailed balance sheets of the main economic sectors (public, private financial, private non-financial, households and non-residents), enabling assessments of maturity, currency, and capital structure mismatches, as well as intersectoral linkages.

10. **The BSA can provide important insights into balance-sheet mismatches which may exacerbate a country's vulnerability to shocks.** One example is foreign currency debt between residents, which is netted out of a country's aggregate balance sheet, but which may result in foreign currency payments problems between residents in the face of adverse shocks. If a government, for example, is unable to roll over its hard currency debts to residents and must draw on foreign currency reserves to honor its debts, the drop in reserves could jeopardize the ability of other sectors to service their external obligations on time. In such circumstances, foreign lenders may decide to curtail their financing as well. With a liberalized capital account, a decline in market confidence could fairly quickly trigger net capital outflows. Close financial linkages between domestic sectors increase the likelihood that difficulties in one sector can spill over into healthy sectors.[8]

---

[7] See Rosenberg et al (2005) for a more comprehensive description of the approach and Mathiesen and Pellechio (2006) for data issues.

[8] As noted in Rosenberg et al (2005) balance sheet problems can originate in various sectors, such as the corporate sector (as in some Asian countries in 1997-98) or the fiscal sector (as in Russia in 1998 and Turkey in 2001). In all these episodes, the banking sector played a key transmission role. Other applications of BSA include Phillips (2003) for Chile, Traa (2003) for Ecuador, Keller (2004) for Peru, Daseking (2004) for

(continued)

11. **For Croatia, the balance-sheet matrices were constructed for end-2000 and end-2005** (Tables IV.1 and IV.2), **spanning the period characterized by a surge in external debt.** For each year, Croatia's economy is disaggregated into nine sectors—the central bank, central government, state and local governments, public non-financial corporations, other depositary corporations, other financial corporations, private non-financial corporations, other residents, and nonresidents. The balance-sheet matrix displays each sector's claims on other sectors as well as its liabilities to other sectors (all intra-sectoral assets and liabilities are netted out). Financial assets and liabilities are broken down by currency (domestic and foreign currency) and by maturity (short and long-term). Because not all assets and liabilities are included in the BSA matrix (more on this below), each sector' total assets may not be equal to its total liabilities. Further data collection is required to fill in the remaining gaps.

12. **Because this is the first attempt to apply the BSA to Croatia, some data shortcomings remain**. Sufficiently detailed balance sheet information was available only for the central bank and other depositary corporations (the Standardized Report Forms (SRFs))[9]. For other sectors, the values of financial claims are derived from the balance sheet positions of the banking sector or from other data sources (e.g., Croatia's International Investment Position).[10] Additional information provided by the CNB was used to identify financial claims denominated in kuna but indexed to a foreign currency. For the purpose of our analysis, such claims were placed in the same category as straight foreign currency instruments. The principal data limitations are summarized below:

- only *financial* balance sheet positions are included in the BSA matrix; for example, real assets and off-balance sheet liabilities (e.g., contingent liabilities) are not included;
- balance sheet positions are recorded at *book value*, not at market value;
- assets and liabilities for which a counterparty is not known are not included in the BSA matrix (for more details, see footnotes in Tables IV.1 and IV.2)[11];

Thailand, Halikias (2004) for Ukraine, Pitt (2004) for Bulgaria, Torres and Mathisen ((2005) for Belize, Sole (2006) for Lebanon , Billmeier and Mathisen (2006) for Georgia, and Lima et al (2006) for Colombia.

[9] The SRFs were developed by the IMF Statistics Department for a uniform reporting of monetary data to the IMF by all countries. The Croatian National Bank has started reporting the SRF-1SR (for the central bank) and SRF-2SR (for other depositary corporations) at end-November 2006. The compilation and reporting of the balance sheet data of other financial corporations (SRF-4SR) is a subject of future work.

[10] See Annex I for a detailed description of data sources.

[11] For example, funds contributed by owners are not included in the sectoral liabilities of the BSA matrix, because such data is not consistently available across sectors and the investing sector is often not known.

- the breakdown of assets and liabilities by maturity is based on the *original maturity*; [12]
- the values of assets and liabilities of the non-bank private sector are derived from the balance-sheet positions of other sectors.

Given the data limitations described above, a sector's net financial position (defined as its total assets minus total liabilities) cannot be strictly interpreted as its "net worth".

13. **More general caveats with regard to the BSA should be kept in mind as well**. *First*, the BSA matrix presents a static picture of the assets and liabilities of the key economic sectors. *Second*, it does not reflect the capacity to generate future cash flows (i.e., the present discounted value of future earnings is not part of the sector's assets). *Third*, the asset and liability positions aggregated at the sectoral level can mask important differences in the positions of individual entities. Thus, while the BSA is a useful tool for analyzing net exposures of the main economic sectors to specific financial shocks and the transmission of shocks across sectors, it is less useful for analyzing credit risk. For example, in addition to the currency and maturity structure of its assets and liabilities, the government's solvency critically depends on its capacity to generate future primary fiscal surpluses (not captured in the BSA matrices).

Aggregate Balance-Sheet Imbalances

14. **Standard macroeconomic indicators suggest that Croatia's external vulnerabilities have increased between end-2000 and end-2005**. All external debt indicators—gross external debt, net external debt and short-term external debt, expressed as a percent of GDP—rose sharply (see Table IV.3), while the debt service ratio (in terms of goods and services) has been hovering around 22 percent of GDP. The level of foreign exchange reserves is one indicator that showed improvement, with the NIR (in months of imports) rising from 3.7 to 4.6 months. The latter, however, seems to have only partially mitigated external liquidity risk, as the ratio of "external debt due within a year" to NIR still rose from about 70 to 75 percent of GDP. Even more worrisome is that "external debt due within a year *plus* the current account deficit" as a share of NIR rose by almost 20 percentage points to reach 102 percent at end-2005.

[12] Partial information is available on amortization coming due in the following year to allow for estimation of certain categories of debt by remaining maturity, but not consistently available across all sectors.

Table IV.1. Croatia: Net Intersectoral Asset and Liability Positions (In millions of Kuna)
(December 2000)

Issuer of liability (debtor)	Public Sector											
Holder of liability (creditor)	Central Bank			Central Government			State and Local Government			Public Nonfinancial Corporations		
	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.
Central bank				1,157	0	1,157	0	0	0	0	0	0
In domestic currency				1,157	0	1,157	0	0	0	0	0	0
Short-term				1,157	0	1,157	0	0	0	0	0	0
Long-term				0	0	0	0	0	0	0	0	0
In foreign currency				0	0	0	0	0	0	0	0	0
Short-term				0	0	0	0	0	0	0	0	0
Long-term				0	0	0	0	0	0	0	0	0
Central government	0	1,157	-1,157				...	...	...	...	...	...
In domestic currency	0	1,157	-1,157				...	...	...	...	...	...
Short-term	0	1,157	-1,157				...	...	...	...	...	...
Long-term	0	0	0				...	...	...	...	...	...
In foreign currency	0	0	0				...	...	...	...	...	...
Short-term	0	0	0				...	...	...	...	...	...
Long-term	0	0	0				...	...	...	...	...	...
State and local government	0	0	0	...	...	...				...	...	...
In domestic currency	0	0	0	...	...	...				...	...	...
Short-term	0	0	0	...	...	...				...	...	...
Long-term	0	0	0	...	...	...				...	...	...
In foreign currency	0	0	0	...	...	...				...	...	...
Short-term	0	0	0	...	...	...				...	...	...
Long-term	0	0	0	...	...	...				...	...	...
Public nonfinancial corps.	0	0	0	...	...	...	...	...	...			
In domestic currency	0	0	0	...	...	...	...	...	...			
Short-term	0	0	0	...	...	...	...	...	...			
Long-term	0	0	0	...	...	...	...	...	...			
In foreign currency	0	0	0	...	...	...	...	...	...			
Short-term	0	0	0	...	...	...	...	...	...			
Long-term	0	0	0	...	...	...	...	...	...			
Other depository corporations	330	14,434	-14,104	6,730	19,055	-12,325	967	1,175	-208	1,515	2,413	-899
In domestic currency	330	7,116	-6,786	3,073	16,006	-12,932	942	383	559	962	106	857
Short-term	330	4,721	-4,392	2,506	3,371	-864	831	359	472	849	85	764
Long-term	0	2,395	-2,395	567	12,635	-12,068	111	24	87	113	21	93
In foreign currency	0	7,318	-7,318	3,657	3,050	607	25	792	-767	552	2,308	-1,755
Short-term	0	5,505	-5,505	0	311	-311	15	141	-126	339	454	-114
Long-term	0	1,813	-1,813	3,657	2,739	919	10	650	-641	213	1,854	-1,641
Other financial corporations	305	8	297	0	0	0	0	0	0	0	0	0
In domestic currency	305	8	297	0	0	0	0	0	0	0	0	0
Short-term	305	0	305	...	0	0	...	...	...	...	...	...
Long-term	0	8	-8	...	0	0	...	...	...	...	...	...
In foreign currency	0	0	0	0	0	0	0	0	0	0	0	0
Short-term	0	0	0	...	0	0	...	...	...	...	...	...
Long-term	0	0	0	...	0	0	...	...	...	...	...	...
Nonfinancial corporations	8	150	-142	...	...	...	...	...	...	...	...	...
In domestic currency	8	150	-142	...	...	...	...	...	...	...	...	...
Short-term	0	0	0	...	...	...	...	...	...	...	...	...
Long-term	8	150	-142	...	...	...	...	...	...	...	...	...
In foreign currency	0	0	0	...	...	...	...	...	...	...	...	...
Short-term	0	0	0	...	...	...	...	...	...	...	...	...
Long-term	0	0	0	...	...	...	...	...	...	...	...	...
Other resident sectors	68	0	68	...	...	...	...	...	...	...	...	...
In domestic currency	68	0	68	...	...	...	...	...	...	...	...	...
Short-term	0	0	0	...	...	...	...	...	...	...	...	...
Long-term	68	0	68	...	...	...	...	...	...	...	...	...
In foreign currency	0	0	0	...	...	...	...	...	...	...	...	...
Short-term	0	0	0	...	...	...	...	...	...	...	...	...
Long-term	0	0	0	...	...	...	...	...	...	...	...	...
Nonresidents	28,832	1,631	27,201	582	40,093	-39,511	...	...	...	...	...	...
In domestic currency	0	1,291	-1,291	...	...	...	...	...	...	...	...	...
Short-term	0	1,291	-1,291	...	...	...	...	...	...	...	...	...
Long-term	0	0	0	...	...	...	...	...	...	...	...	...
In foreign currency	28,832	340	28,492	582	40,093	-39,511	...	...	...	...	...	...
Short-term	27,627	340	27,287	563	2,949	-2,386	...	...	...	...	...	...
Long-term	1,205	0	1,205	19	37,145	-37,125	...	...	...	...	...	...

Table IV.1. (continued) Croatia: Net Intersectoral Asset and Liability Positions (In millions of Kuna) (December 2000)

Financial Sector						Nonfinancial Private Sector						Rest of the World		
Other Depository Corporations 2/			Other Financial Corporations			Nonfinancial Corporations			Other Resident Sectors			Nonresidents		
Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.
14,434	330	14,104	8	305	-297	150	8	142	0	68	-68	1,631	28,832	-27,201
7,116	330	6,786	8	305	-297	150	8	142	0	68	-68	1,291	0	1,291
7,116	330	6,786	8	305	-297	150	8	142	0	0	0	1,291	0	1,291
0	0	0	0	0	0	0	0	0	0	68	-68	0	0	0
7,318	0	7,318	0	0	0	0	0	0	0	0	0	340	28,832	-28,492
7,318	0	7,318	0	0	0	0	0	0	0	0	0	340	28,832	-28,492
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19,055	6,730	12,325	0	0	0	...	...	...	...	...	...	40,093	582	39,511
16,006	3,073	12,932	0	0	0	...	...	...	...	...	...	...	...	...
3,371	-73	3,443	0	...	0	...	...	...	...	...	...	...	...	...
12,635	3,146	9,489	0	...	0	...	...	...	...	...	...	...	...	...
3,050	3,657	-607	0	0	0	...	...	...	...	...	...	40,093	582	39,511
311	0	311	0	...	0	...	...	...	...	...	...	2,949	563	2,386
2,739	3,657	-919	0	...	0	...	...	...	...	...	...	37,145	19	37,125
1,175	967	208	0	0	0	...	...	...	...	...	...	...	...	...
383	942	-559	0	0	0	...	...	...	...	...	...	...	...	...
359	831	-472	...	...	...	...	...	...	...	...	...	...	...	...
24	111	-87	...	...	...	...	...	...	...	...	...	...	...	...
792	25	767	0	0	0	...	...	...	...	...	...	...	...	...
141	15	126	...	...	...	...	...	...	...	...	...	...	...	...
650	10	641	...	...	...	...	...	...	...	...	...	...	...	...
2,413	1,515	899	0	0	0	...	...	...	...	...	...	...	...	...
106	962	-857	0	0	0	...	...	...	...	...	...	...	...	...
85	849	-764	...	...	...	...	...	...	...	...	...	...	...	...
21	113	-95	...	...	...	...	...	...	...	...	...	...	...	...
2,308	552	1,755	0	0	0	...	...	...	...	...	...	...	...	...
454	339	114	...	...	...	...	...	...	...	...	...	...	...	...
1,854	213	1,641	...	...	...	...	...	...	...	...	...	...	...	...
			2,404	230	2,174	14,617	33,447	-18,830	49,464	23,298	26,166	17,810	19,710	-1,901
			1,825	-22	1,847	7,084	8,691	-1,607	6,510	2,711	3,798	140	70	70
			1,300	-114	1,414	6,250	3,527	2,723	4,751	1,830	2,920	123	5	118
			525	91	433	834	5,164	-4,330	1,759	881	878	17	65	-48
			579	253	326	7,533	24,756	-17,223	42,954	20,587	22,367	17,670	19,640	-1,971
			354	253	101	4,625	9,150	-4,525	26,372	1,227	25,145	2,141	11,551	-9,410
			225	0	225	2,908	15,606	-12,698	16,582	19,360	-2,778	15,529	8,090	7,440
230	2,404	-2,174				0	0	0	0	0	0	0	0	0
-22	1,825	-1,847				0	0	0	0	0	0	0	0	0
-114	1,300	-1,414				...	...	...	...	...	...	...	...	...
91	525	-433				...	...	...	...	...	...	...	...	...
253	579	-326				0	0	0	0	0	0	0	0	0
253	354	-101				...	...	...	...	...	...	0	0	0
0	225	-225				...	...	...	...	...	...	0	0	0
33,447	14,617	18,830	0	0	0				...	...	...	33,776	11,232	22,545
8,691	7,084	1,607	0	0	0				...	...	...	...	...	...
3,527	6,250	-2,723	...	...	...				...	...	...	...	...	...
5,164	834	4,330	...	...	...				...	...	...	...	...	...
24,756	7,533	17,223	0	0	0				...	...	...	33,776	11,232	22,545
9,150	4,625	4,525	...	...	...				...	...	...	428	9,322	-8,893
15,606	2,908	12,698	...	...	...				...	...	...	33,348	1,910	31,438
23,298	49,464	-26,166	0	0	0	...	...	...				...	...	...
2,711	6,510	-3,798	0	0	0	...	...	...				...	...	...
1,830	4,751	-2,920	...	...	...	...	...	...				...	...	...
881	1,759	-878	...	...	...	...	...	...				...	...	...
20,587	42,954	-22,367	0	0	0	...	...	...				...	...	...
1,227	26,372	-25,145	...	...	...	...	...	...				...	...	...
19,360	16,582	2,778	...	...	...	...	...	...				...	...	...
19,710	17,810	1,901	0	0	0	11,232	33,776	-22,545	...	...	...			
70	140	-70	0	0	0	...	...	...	...	...	...			
5	123	-118	...	...	...	...	...	...	...	...	...			
65	17	48	...	...	...	...	...	...	...	...	...			
19,640	17,670	1,971	0	0	0	11,232	33,776	-22,545	...	...	...			
11,551	2,141	9,410	...	...	...	9,322	428	8,893	...	...	...			
8,090	15,529	-7,440	...	...	...	1,910	33,348	-31,438	...	...	...			

Sources: Croatian National Bank, Ministry of Finance, and authors' estimates.

1/ Includes trade credit/advances, settlement accounts, new equity of households in life insurance and pension funds (if applicable).
2/ Claims of ODCs do not include 0.5 billion kuna of currency holdings and 4.3 billion kuna of non-financial assets;
Liabilities of ODCs do not include 14.6 billion kuna of equity contributions by owners and 10.3 billion kuna of loss provisions.

Table IV.2. Croatia: Net Intersectoral Asset and Liability Positions (In millions of Kuna)
(December 2005)

Issuer of liability (debtor)	Public sector											
Holder of liability (creditor)	Central Bank			Central Government			State and Local Government			Public Nonfinancial Corporations		
	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.
Central bank				345	1	344	0	0	0	0	0	0
In domestic currency				332	1	331	0	0	0	0	0	0
Short-term				332	1	331	0	0	0	0	0	0
Long-term				0	0	0	0	0	0	0	0	0
In foreign currency				13	0	13	0	0	0	0	0	0
Short-term				13	0	13	0	0	0	0	0	0
Long-term				0	0	0	0	0	0	0	0	0
Central government	1	345	-344				...	...	...	...	...	...
In domestic currency	1	332	-331				...	...	...	...	...	...
Short-term	1	332	-331				...	...	...	...	...	...
Long-term	0	0	0				...	...	...	...	...	...
In foreign currency	0	13	-13				...	...	...	...	...	...
Short-term	0	13	-13				...	...	...	...	...	...
Long-term	0	0	0				...	...	...	...	...	...
State and Local Government	0	0	0	...	...	...				...	...	...
In domestic currency	0	0	0	...	...	...				...	...	...
Short-term	0	0	0	...	...	...				...	...	...
Long-term	0	0	0	...	...	...				...	...	...
In foreign currency	0	0	0	...	...	...				...	...	...
Short-term	0	0	0	...	...	...				...	...	...
Long-term	0	0	0	...	...	...				...	...	...
Public Nonfinancial Corps.	0	0	0	...	...	...	...	...	...			
In domestic currency	0	0	0	...	...	...	...	...	...			
Short-term	0	0	0	...	...	...	...	...	...			
Long-term	0	0	0	...	...	...	...	...	...			
In foreign currency	0	0	0	...	...	...	...	...	...			
Short-term	0	0	0	...	...	...	...	...	...			
Long-term	0	0	0	...	...	...	...	...	...			
Other depository corporations	4,222	39,566	-35,344	9,336	29,191	-19,854	2,228	1,792	436	1,373	6,469	-5,096
In domestic currency	4,222	26,070	-21,848	7,634	17,776	-10,142	1,838	666	1,173	589	606	-17
Short-term	4,222	26,070	-21,848	11	13,361	-13,350	342	298	43	232	336	-104
Long-term	0	0	0	7,623	4,416	3,208	1,497	367	1,129	357	271	87
In foreign currency	0	13,496	-13,496	1,702	11,414	-9,713	390	1,126	-736	784	5,863	-5,079
Short-term	0	13,496	-13,496	0	124	-124	110	45	65	252	640	-387
Long-term	0	0	0	1,702	11,290	-9,588	280	1,081	-801	532	5,223	-4,691
Other financial corporations	78	0	78	0	21,367	-21,367	0	0	0	0	0	0
In domestic currency	78	0	78	0	4,273	-4,273	0	0	0	0	0	0
Short-term	78	0	78	...	4,273	-4,273	...	...	...	...	...	...
Long-term	0	0	0	...	0	0	...	...	...	...	...	...
In foreign currency	0	0	0	0	17,094	-17,094	0	0	0	0	0	0
Short-term	0	0	0	...	0	0	...	...	...	...	...	...
Long-term	0	0	0	...	17,094	-17,094	...	...	...	...	...	...
Nonfinancial corporations	13	0	13	...	...	...	...	...	...	...	...	...
In domestic currency	13	0	13	...	...	...	...	...	...	...	...	...
Short-term	0	0	0	...	...	...	...	...	...	...	...	...
Long-term	13	0	13	...	...	...	...	...	...	...	...	...
In foreign currency	0	0	0	...	...	...	...	...	...	...	...	...
Short-term	0	0	0	...	...	...	...	...	...	...	...	...
Long-term	0	0	0	...	...	...	...	...	...	...	...	...
Other resident sectors	22	0	22	...	...	...	...	...	...	...	...	...
In domestic currency	22	0	22	...	...	...	...	...	...	...	...	...
Short-term	0	0	0	...	...	...	...	...	...	...	...	...
Long-term	22	0	22	...	...	...	...	...	...	...	...	...
In foreign currency	0	0	0	...	...	...	...	...	...	...	...	...
Short-term	0	0	0	...	...	...	...	...	...	...	...	...
Long-term	0	0	0	...	...	...	...	...	...	...	...	...
Nonresidents	54,908	19	54,889	465	51,983	-51,518	...	...	...	...	...	...
In domestic currency	0	10	-10	...	...	...	...	...	...	...	...	...
Short-term	0	10	-10	...	...	...	...	...	...	...	...	...
Long-term	0	0	0	...	...	...	...	...	...	...	...	...
In foreign currency	54,908	9	54,899	465	51,983	-51,518	...	...	...	...	...	...
Short-term	54,862	9	54,853	400	0	400	...	...	...	...	...	...
Long-term	46	0	46	66	51,983	-51,917	...	...	...	...	...	...

Table IV.2. (continued) Croatia: Net Intersectoral Asset and Liability Positions (In millions of Kuna)
(December 2005)

Financial Sector						Nonfinancial Private Sector						Rest of the World		
Other Depository Corporations			Other Financial Corporations			Nonfinancial Corporations			Other Resident Sectors			Nonresidents		
Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.
39,566	4,222	35,344	0	78	-78	0	13	-13	0	22	-22	19	54,908	-54,889
26,070	4,222	21,848	0	78	-78	0	13	-13	0	22	-22	10	0	10
26,070	4,222	21,848	0	78	-78	0	13	-13	0	0	0	10	0	10
0	0	0	0	0	0	0	0	0	0	22	-22	0	0	0
13,496	0	13,496	0	0	0	0	0	0	0	0	0	9	54,908	-54,899
13,496	0	13,496	0	0	0	0	0	0	0	0	0	9	54,908	-54,899
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29,191	9,336	19,854	21,367	0	21,367	...	...	...	...	...	...	51,983	465	51,518
17,776	7,634	10,142	4,273	0	4,273	...	...	...	...	...	...	...	...	...
13,361	-12,523	25,884	4,273	...	4,273	...	...	...	...	...	...	...	...	...
4,416	20,158	-15,742	0	...	0	...	...	...	...	...	...	...	...	...
11,414	1,702	9,713	17,094	0	17,094	...	...	...	...	...	...	51,983	465	51,518
124	0	124	0	...	0	...	...	...	...	...	...	0	400	-400
11,290	1,702	9,588	17,094	...	17,094	...	...	...	...	...	...	51,983	66	51,917
1,792	2,228	-436	0	0	0	...	...	...	...	...	...	...	...	...
666	1,838	-1,173	0	0	0	...	...	...	...	...	...	...	...	...
298	342	-43	...	...	...	...	...	...	...	...	...	...	...	...
367	1,497	-1,129	...	...	...	...	...	...	...	...	...	...	...	...
1,126	390	736	0	0	0	...	...	...	...	...	...	...	...	...
45	110	-65	...	...	...	...	...	...	...	...	...	...	...	...
1,081	280	801	...	...	...	...	...	...	...	...	...	...	...	...
6,469	1,373	5,096	0	0	0	...	...	...	...	...	...	...	...	...
606	589	17	0	0	0	...	...	...	...	...	...	...	...	...
336	232	104	...	...	...	...	...	...	...	...	...	...	...	...
271	357	-87	...	...	...	...	...	...	...	...	...	...	...	...
5,863	784	5,079	0	0	0	...	...	...	...	...	...	...	...	...
640	252	387	...	...	...	...	...	...	...	...	...	...	...	...
5,223	532	4,691	...	...	...	...	...	...	...	...	...	...	...	...
			7,214	1,773	5,441	34,598	61,175	-26,577	100,381	78,971	21,409	67,800	35,969	31,832
			3,944	1,039	2,904	20,514	19,987	527	18,708	16,206	2,502	2,392	113	2,279
			2,588	487	2,101	5,841	9,941	-4,100	4,366	7,624	-3,258	1,532	112	1,421
			1,355	552	803	14,673	10,046	4,627	14,341	8,582	5,759	859	2	858
			3,270	734	2,536	14,085	41,188	-27,104	81,673	62,765	18,908	65,409	35,856	29,553
			2,874	702	2,172	6,605	8,061	-1,456	37,326	1,840	35,486	16,388	8,636	7,752
			396	31	364	7,480	33,128	-25,648	44,347	60,925	-16,578	49,021	27,220	21,801
1,773	7,214	-5,441				0	0	0	26,730	0	26,730	0	0	0
1,039	3,944	-2,904				0	0	0	26,730	0	26,730	0	0	0
487	2,588	-2,101				...	...	...	5,346	0	5,346	...	...	...
552	1,355	-803				...	...	...	21,384	0	21,384	...	...	...
734	3,270	-2,536				0	0	0	0	0	0	0	0	0
702	2,874	-2,172				...	...	...	...	...	...	0	0	0
31	396	-364				...	...	...	...	...	...	0	0	0
61,175	34,598	26,577	0	0	0				...	...	...	73,256	11,134	62,122
19,987	20,514	-527	0	0	0				...	...	...	...	...	...
9,941	5,841	4,100	...	...	...				...	...	...	...	...	...
10,046	14,673	-4,627	...	...	...				...	...	...	...	...	...
41,188	14,085	27,104	0	0	0				...	...	...	73,256	11,134	62,122
8,061	6,605	1,456	...	...	...				...	...	...	2,148	8,572	-6,424
33,128	7,480	25,648	...	...	...				...	...	...	71,108	2,562	68,546
78,971	100,381	-21,409	0	26,730	-26,730	...	...	...				...	...	...
16,206	18,708	-2,502	0	26,730	-26,730	...	...	...				...	...	...
7,624	4,366	3,258	0	5,346	-5,346	...	...	...				...	...	...
8,582	14,341	-5,759	0	21,384	-21,384	...	...	...				...	...	...
62,765	81,673	-18,908	0	0	0	...	...	...				...	...	...
1,840	37,326	-35,486	...	...	...	...	...	...				...	...	...
60,925	44,347	16,578	...	...	...	...	...	...				...	...	...
35,969	67,800	-31,832	0	0	0	11,134	73,256	-62,122	...	...	...			
113	2,392	-2,279	0	0	0	...	...	...	...	...	...			
112	1,532	-1,421	...	...	...	...	...	...	...	...	...			
2	859	-858	...	...	...	...	...	...	...	...	...			
35,856	65,409	-29,553	0	0	0	11,134	73,256	-62,122	...	...	...			
8,636	16,388	-7,752	...	...	...	8,572	2,148	6,424	...	...	...			
27,220	49,021	-21,801	...	...	...	2,562	71,108	-68,546	...	...	...			

Sources: Croatian National Bank, Ministry of Finance, and authors' estimates.

1/ Includes trade credit/advances, settlement accounts, new equity of households in life insurance and pension funds (if applicable).
2/ Claims of ODCs do not include 2.2 billion kuna of currency holdings and 5.4 billion kuna of non-financial assets;
Liabilities of ODCs do not include 23.8 billion kuna of equity contributions by owners and 8.8 billion kuna of loss provisions.

15. **The balance-sheet data confirms a significant deterioration in Croatia's aggregate net external position during 2000-05** (from -22 percent of GDP at end-2000 to -40 percent of GDP at end-2005, see Table IV.3). Furthermore, the net external debt position at end-2005 appears to have been mostly made up of the private sector's liabilities (at end-2005, the CNB's net positive external position was roughly offset by the public sector's net negative external position). In fact, the net external liabilities of both private financial and non-financial sectors seem to have increased by roughly 12–13 percent of GDP. The next section takes a closer look at the sectoral balance sheets.

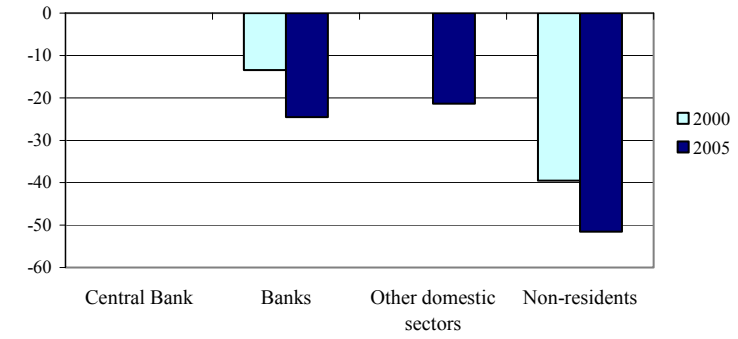
Table IV.3: External Vulnerability Indicators, Aggregate and Sectoral Net Financial Positions

	2000	2001	2002	2003	2004	2005
External solvency and liquidity indicators *(in percent, unless indicated otherwise)*						
Gross external debt/GDP	**60.6**	60.7	61.5	75.5	80.2	**82.5**
Net external debt/GDP 1/	**28.7**	16.6	24.2	32.9	37.6	**42.9**
External short-term debt (by original maturity)/GDP	**4.8**	2.6	2.3	6.2	9.2	**9.6**
External debt service/Exports of goods and services	**24.0**	26.3	22.1	20.1	22.4	**22.2**
External debt due within a year/NIR	**69.6**	53.4	41.7	59.2	80.1	**75.1**
(External debt due within a year +CAD)/NIR	**83.3**	69.4	77.0	85.0	102.7	**101.5**
NIR (in months of imports)	**3.7**	4.4	4.5	4.6	4.4	**4.6**
Net financial positions at end-2000 and at end-2005 2/ *(in percent of GDP)*						
All domestic sectors						
Net external position 3/	-22					-40
Central bank						
Net external financial position	18					24
Net foreign currency position	14					18
Net short-term foreign currency position	14					18
Public sector						
Net external financial position	-26					-22
Net foreign currency position	-24					-26
Net short-term foreign currency position	0					0
Private financial sector						
Net external financial position	1					-14
Net foreign currency position	4					11
Net short-term foreign currency position	-2					-12
Private non-financial sector						
Net external financial position	-15					-27
Net foreign currency position	-11					-31
Net short-term foreign currency position	19					18

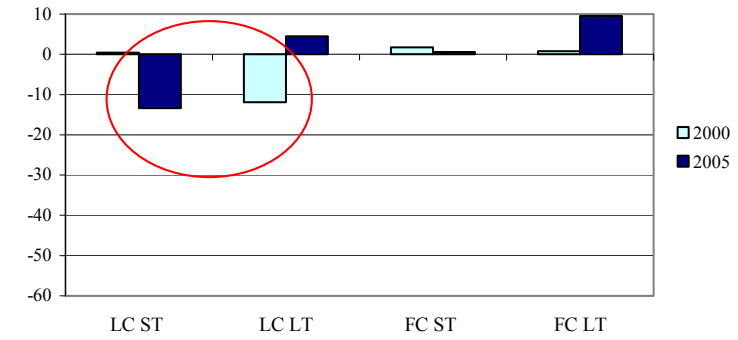
1/ Net external debt is defined as gross external debt minus foreign assets of CNB and commercial banks;
2/ Net financial position is defined as assets minus liabilities;
3/ External liabilities do not include "equity capital and reinvested earnings"

Sectoral Balance-Sheet Positions

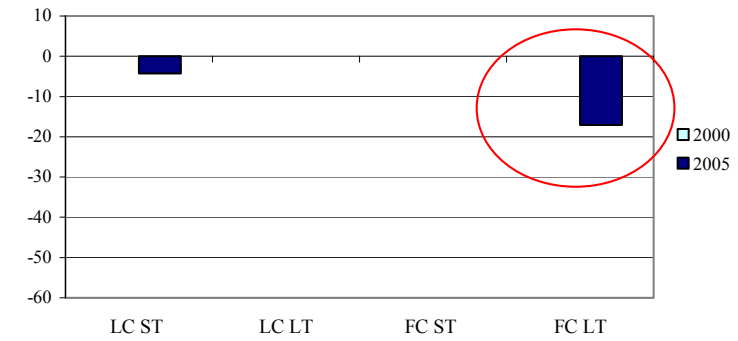
Figure IV.1: Net Financial Positions of the Public Sector
(in billions of kuna)
- vis-à-vis all sectors



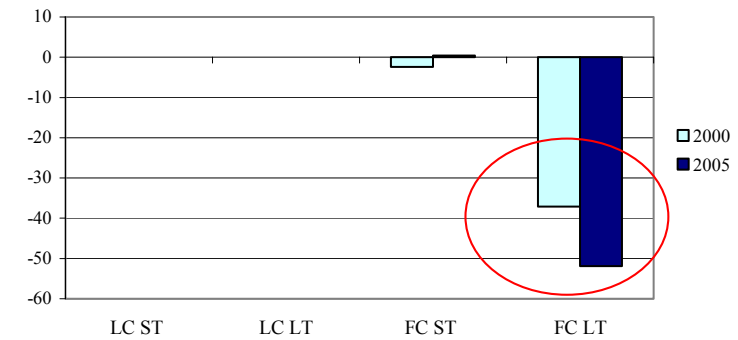
- vis-à-vis banks (by currency and maturity)



- vis-à-vis other domestic sectors, excl. banks (by currency and maturity)



- vis-a-vis non-residents (by currency and maturity)



Public Sector

16. **The public sector comprises the central government, state and local governments and public non-financial corporations** (the CNB's balance-sheet is analyzed separately). Noteworthy changes in the public sector's balance sheet that occurred between 2000 and 2005 are highlighted below (and shown in Figure IV.1):

- ***Gross public debt*** rose from 41 percent of GDP at end-2000 to 48 percent of GDP at end-2005, with the non-bank financial institutions representing a growing share of the investor base (these numbers do not include government guarantees and liabilities of the HBOR, the Croatian Development Bank; if the latter are included, gross public debt would be over 54 percent of GDP at end-2005);

- ***Gross foreign currency debt*** increased from 26 percent of GDP at end-2000 to around 30 percent of GDP at end-2005, on the back of

strong domestic demand for foreign currency denominated or indexed government paper.[13]

- Encouragingly, the ***gross external debt*** of the public sector rose in absolute terms, but fell when measured in relation to GDP (from 26 percent in 2000 to 23 percent in 2005). Virtually all public external debt is denominated in foreign currency and issued in medium and long tenors.

- While the ***average maturity*** of foreign currency debt has remained unchanged (mostly medium or long-term), the maturity of straight kuna debt appears to have been shortened (at end-2005, over 80 percent of this debt was in the form of short-term instruments, compared to around 20 percent at end-2000) .

17. **To sum up, the key concerns with regard to the public sector are its level of gross debt and its net foreign currency exposure.** Indeed, public debt in Croatia is above the EU average, though still below the 60 percent Maastricht criterion. Although public debt sustainability analysis does not reveal any major solvency concerns, continued fiscal consolidation, which is part of the government's medium-term strategy, should help to ensure that public debt-to-GDP ratio remains on a sustainable path. A large share of foreign currency debt, which exposes the public sector to exchange rate risk, is another potential source of vulnerability. Stress-testing shows that a plausible, one-time exchange rate shock could push the public debt to GDP ratio above 60 percent of GDP, though it is likely to remain on a downward trend.[14] It should be noted, however, that by issuing foreign currency-denominated or linked debt instruments in the domestic market, the government provides residents with financial assets that could be used to hedge their kuna-denominated earnings against possible exchange rate depreciation. Thus, to the extent that the private sector may have large unhedged currency exposure, the government's provision of currency hedges to residents may be justified (at least temporarily), so long as it does not undermine the government's financial position.

The Central Bank

18. **The central bank's position vis-à-vis the rest of the world has improved greatly between 2000 and 2005.** At the end of 2000, gross reserves were €3.8 billion, with net reserves at €3.6 billion due to outstanding credit from the IMF. At end-2005, gross reserves

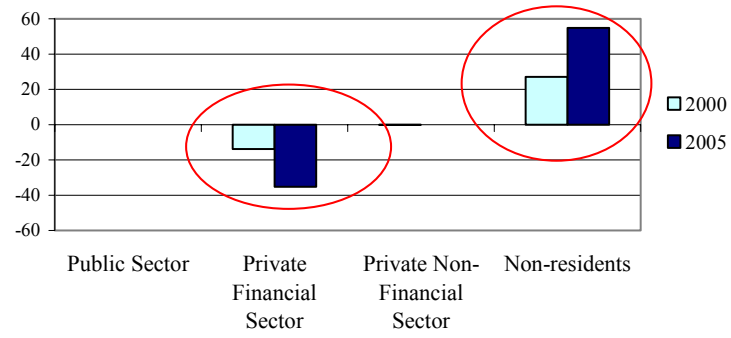
[13] In all Charts, "FC" and "LC" stand for foreign currency (denominated or indexed) and local currency, respectively; "ST" and "LT" stand for short-term (one year or less) and long-term (more than one year), respectively.

[14] See Staff report, Appendix IV. These results are similar to those obtained by the Ministry of Finance.

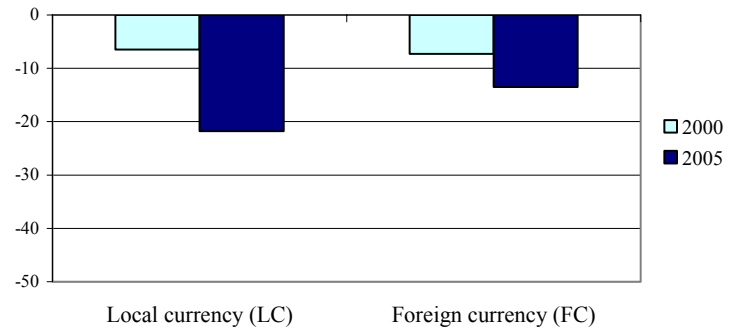
stood at €7.4 billion and were mostly invested in highly-rated and highly-liquid euro-denominated securities.

19. **One wrinkle, however, is that a quarter of the central bank's gross foreign reserves are effectively liabilities to domestic banks.** Indeed, the central banks' net liabilities to banks (foreign currency deposits of domestic banks resulting from the general and marginal reserve requirements, see Table IV.5 in Appendix II) have increased from around €1 billion at end-2000 to over €1.8 billion at end 2005. These deposits are neither fully available to, nor controllable by, the central bank. This means that an exogenous change in the base for reserve requirements—for example, less external borrowing by banks—could lead to a drop in the central bank's foreign reserves. Even in the absence of shocks, the banks' foreign currency deposits with the CNB may decline if reserve requirements were to be reduced.

Figure IV.2: The Central Bank's Net Financial Positions
(in billions of kuna)
- vis-à-vis all sectors



- vis-à-vis private financial sector (by currency)



20. **All of the above suggests that the "NIR net of banks foreign currency deposits" (NNIR) is a more appropriate measure of usable reserves**. Because banks' foreign currency deposits at the CNB could be used by the banks themselves to reduce their external debt, the external debt to NNIR ratio would represent an upper bound estimate of external liquidity risk: at end-2005, "external debt due within a year" was close to 100 percent of NNIR (compared to 75 percent of NIR) and "external debt due within a year *plus* the current account deficit" was 135 percent of NNIR (versus 102 percent of NIR).

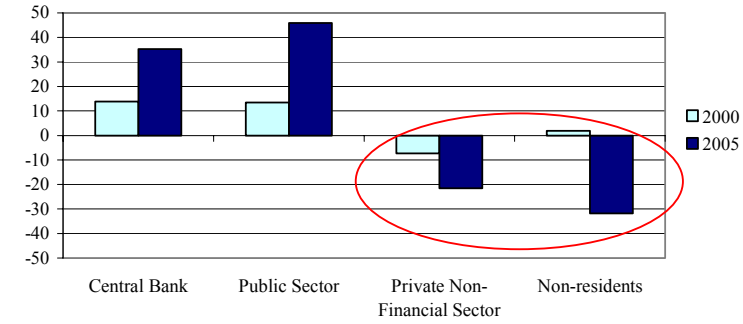
Private Financial Sector

21. **Croatia's private financial sector is dominated by foreign-owned banks, with other financial institutions accounting for a fairly modest share of total financial**

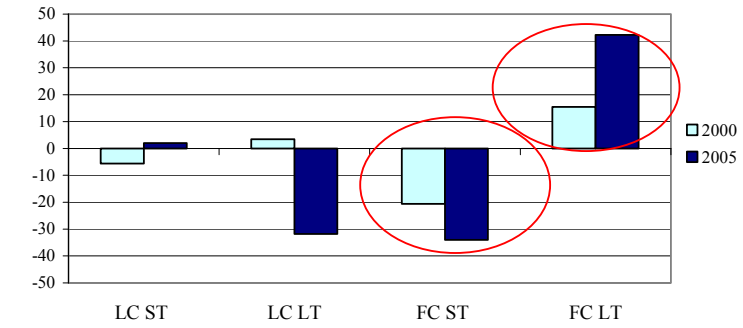
sector's assets.[15] A comparison of the private financial sector's balance-sheet positions at end-2000 and at end-2005, reveals that it has:

Figure IV.3: Net Financial Positions of the Private Financial Sector
(in billions of kuna)

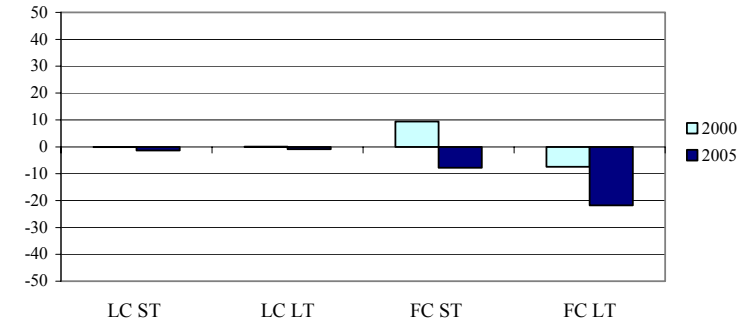
- vis-à-vis all sectors



- vis-à-vis private non-financial sector (by currency and maturity)



- vis-à-vis non-residents (by currency and maturity)



- significantly increased its net positive exposures to the CNB and the public sector, likely reflecting progressive hikes in reserve requirements and larger holdings of government bonds;

- increased its borrowing from the private non-financial sector, reflecting a build-up in the non-bank financial institutions' liabilities to households[16];

- significantly increased borrowing from abroad (its net external position shifted from ±-1 percent of GDP at end-2000 to -14 percent of GDP at end-2005), likely facilitated by foreign ownership of Croatian banks and favorable external financing conditions.

22. **The net foreign currency position of the financial sector remained positive**. Moreover, it seems to have increased from 4 percent of GDP at end-2000 to about 11 percent of GDP at end-2005. But if we take out the non-bank holdings of government bonds, the end-2005 position would be only around 2 percent of

[15] At end-2005, other financial corporations (pension funds, insurance companies, mutual funds) accounted for about 22 percent of total financial system's assets (see Staff report, Table 4).

[16] Private non-financial sector's claims on the non-bank financial sector are assumed to be in local currency

GDP.[17] Nonetheless, a positive net foreign currency position implies that the private financial sector would not suffer from (direct) losses due to an exchange rate depreciation. This, however, does not mean that it would be completely unaffected by a kuna depreciation. To the extent that bank loans were extended to domestic firms and households that have no foreign currency assets or earnings, banks would be exposed to the foreign currency-induced credit risk.

23. **The net short-term foreign currency position of the financial sector remained negative**. It appears to have deteriorated from -2 percent of GDP to -12 percent of GDP. This is not surprising given that the proportion of short-term foreign currency bank deposits remained stable (at around 60 percent of total deposits), while the share of short-term foreign currency loans declined (from 18 percent to 7 percent of total bank loans). The extension of loan maturity is, by itself, a welcome development. However, because most borrowing and lending is in foreign currency, it was reflected in a deterioration of the banks' foreign exchange liquidity position. Also, until recently, foreign-currency linked bank loans, were not included in the base for the calculation of the foreign exchange liquidity requirement.[18]

24. **Focusing on banks**, **the net exposure of banks to the private non-financial sector has turned from negative** (-5 percent of GDP at end-2000) **to positive** (2 percent of GDP at end-2005), **though it remained much smaller than banks' positive exposure to the public sector.** In addition, banks seem to have maintained a net negative position vis-à-vis households, notwithstanding a vigorous expansion of consumer credit, but significantly increased their positive exposure to non-financial corporations (see Figure IV.4). Indeed, household deposits (mostly in foreign currency) remained a significant source of bank funding, more than offsetting bank loans to households.

25. **The rapid build-up of the banks' external debt resulted in a large net negative position of banks vis-à-vis non-residents** (see Figure IV.4). This implies that banks have become much more sensitive to foreign interest rate and debt rollover risks, notwithstanding their direct investment relationship with foreign banks. Mitigating these risks are the facts that banks' funding sources seem to be fairly well diversified (between domestic and external) and that most of the banks' loan products are offered at adjustable rates. In addition, Croatian banks have also become more exposed to the risk of contagion (through common lenders), i.e., they may be adversely affected by a credit event that occurs elsewhere in the region and has a negative impact on the financial position of one of their parent banks.

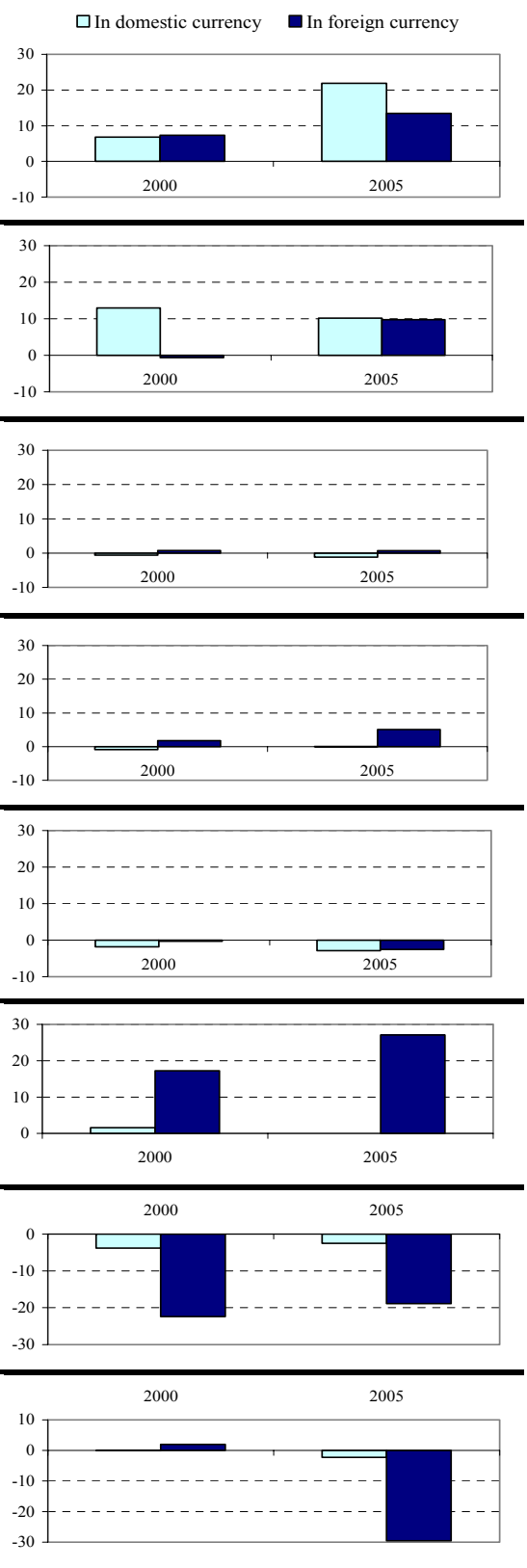
---

[17] Although certain liabilities are not included in the BSA matrix, notably "shares and other equity" (about 10 percent of GDP in both 2000 and 2005) this is should not affect the net foreign currency position.

[18] See Table IV.5, Appendix II, the Decision on the Minimum Required Amount of Foreign Currency Claims as of October 2, 2006.

Figure IV.4: Banks' Net Financial Positions vis-à-vis Domestic and External Sectors (in billions of kuna)

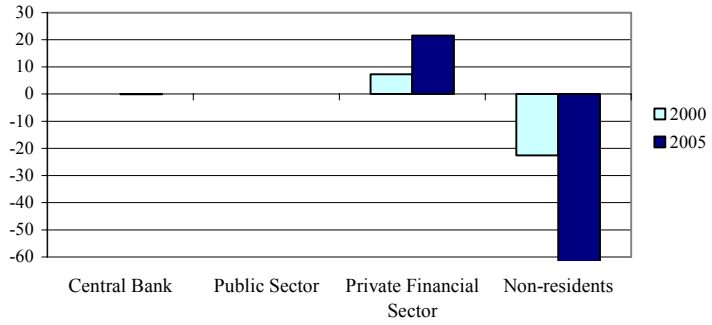
	2000	2005
Central bank	**14.1**	**35.3**
In domestic currency	6.8	21.8
Short-term	6.8	21.8
Long-term	0.0	0.0
In foreign currency	7.3	13.5
Short-term	7.3	13.5
Long-term	0.0	0.0
Central government	**12.3**	**19.9**
In domestic currency	12.9	10.1
Short-term	3.4	25.9
Long-term	9.5	-15.7
In foreign currency	-0.6	9.7
Short-term	0.3	0.1
Long-term	-0.9	9.6
State and Local Government	**0.2**	**-0.4**
In domestic currency	-0.6	-1.2
Short-term	-0.5	0.0
Long-term	-0.1	-1.1
In foreign currency	0.8	0.7
Short-term	0.1	-0.1
Long-term	0.6	0.8
Public Nonfinancial Corps.	**0.9**	**5.1**
In domestic currency	-0.9	0.0
Short-term	-0.8	0.1
Long-term	-0.1	-0.1
In foreign currency	1.8	5.1
Short-term	0.1	0.4
Long-term	1.6	4.7
Other financial corporations	**-2.2**	**-5.4**
In domestic currency	-1.8	-2.9
Short-term	-1.4	-2.1
Long-term	-0.4	-0.8
In foreign currency	-0.3	-2.5
Short-term	-0.1	-2.2
Long-term	-0.2	-0.4
Nonfinancial corporations	**18.8**	**26.6**
In domestic currency	1.6	-0.5
Short-term	-2.7	4.1
Long-term	4.3	-4.6
In foreign currency	17.2	27.1
Short-term	4.5	1.5
Long-term	12.7	25.6
Other resident sectors	**-26.2**	**-21.4**
In domestic currency	-3.8	-2.5
Short-term	-2.9	3.3
Long-term	-0.9	-5.8
In foreign currency	-22.4	-18.9
Short-term	-25.1	-35.5
Long-term	2.8	16.6
Nonresidents	**1.9**	**-31.8**
In domestic currency	-0.1	-2.3
Short-term	-0.1	-1.4
Long-term	0.0	-0.9
In foreign currency	2.0	-29.6
Short-term	9.4	-7.8
Long-term	-7.4	-21.8



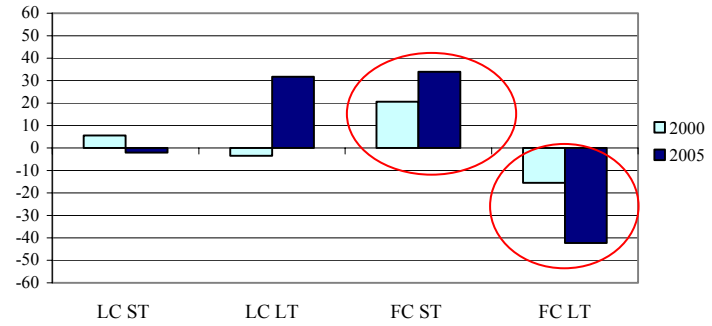
Source: Standardized report forms for monetary and financial data

26. **To sum up, while Croatia's financial sector does not seem to suffer from major balance sheet imbalances, its potential vulnerabilities could stem from its large net negative position vis-à-vis non-residents and its credit exposure to the domestic private non-financial sector.**[19]

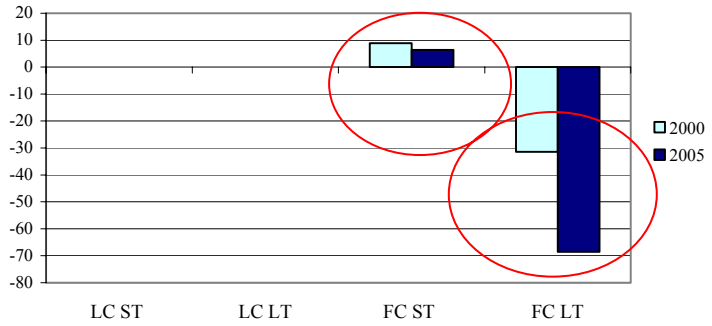
Figure IV.5: Net Financial Positions of the Private Non-Financial Sector
(in billions of kuna)
- vis-à-vis all sectors



- vis-à-vis private financial sector (by currency and maturity)



- vis-à-vis non-residents (by currency and maturity)



Private Non-Financial Sector

27. **The private non-financial sector includes non-financial firms and households** (Figure IV.5). Based on the available data, the private non-financial sector seems to have maintained net long positions vis-à-vis domestic sectors and significantly increased its borrowing from abroad. The key changes in the sector's financial position were as follows:

- The ***net external position*** of the private non-financial sector has deteriorated from -15 percent of GDP at end-2000 to -27 percent of GDP at end-2005, with the bulk of external liabilities in foreign currency and long tenors (by original maturity).[20]

- The ***net foreign currency position*** of the private

[19] For more details, see another Selected Issues paper on "Bank Stability and Credit Risk in Croatian Banks."

[20] It should be noted that the non-residents' claims on "direct investment enterprises" (which are included in the total non-financial sector's liabilities to non-residents) amounted to about 3 percent of GDP at end-2000 and to about 7 percent of GDP at end-2005. Also, because available data does not fully capture the Croatian residents' assets abroad, the BSA matrices may be overstating the size of the net negative external position of the private non-financial sector.

non-financial sector has deteriorated from -11 percent of GDP at end-2000 to -31 percent of GDP at end-2005, as Croatian firms borrowed from both non-residents and domestic banks predominantly in foreign currency. According to a new CNB report, around 80 percent of all foreign currency bank loans are made to unhedged clients. Most liabilities are reportedly contracted at variable rates.

28. **Thus, the fairly large net negative foreign currency exposure and rising external debt are the key concerns with regard to the private non-financial sector**. Although Croatian firms seem to be trying to diversify their funding sources (between domestic banks and non-residents) and mainly borrow long-term (by original maturity), it does not fully insulate them from debt rollover risk. In addition, given that most of their liabilities are contracted at variable rates, non-financial firms and households are likely to be sensitive to changes in domestic and foreign interest rates. Finally, the apparent lack of foreign currency hedging implies that private non-financial sector is likely to suffer losses in the event of the kuna depreciation.

D. Sensitivity Analysis

29. **This section attempts to assess the sensitivity of the private sector's balance sheets to financial shocks by focusing on aggregate liquidity ratios**. *First*, aggregate liquidity ratios are computed for the financial, non-financial and corporate sectors based on the BSA matrices. *Second*, aggregate liquidity ratios are computed for two hypothetical scenarios: a 30 percent nominal exchange rate depreciation[21], and a 300 basis point rise in foreign interest rate (see Table IV.4). A liquidity ratio is defined here as a ratio of short-term liabilities to short-term assets (by original or remaining maturity, total or only in foreign currency, see Table IV.4 for details). It is generally believed that for a non-financial firm, the ratio of short-term liabilities to short-term assets should not be much higher than 100 percent. Implicit here is the idea that if a company gets in trouble (poor earnings, debt rollover problems, etc.), it may have to liquidate some (or all) of its short-term assets to meet its maturing obligations, thus 100 percent is generally viewed as a prudent benchmark.[22] Naturally, this simple rule should not be mechanically applied to the aggregated sectoral balance sheet data.

30. **Based on the available data, private non-financial corporations appear most vulnerable.** The question that we are asking here is whether a given sector has sufficient

[21] More than 80 percent of all non-local currency bank assets and liabilities are either euro-denominated or euro-indexed.

[22] It is also a well known fact that most corporate defaults occur because of liquidity, not because of solvency problems.

short-term assets to cover maturing liabilities[23] in the event of distress accompanied by a significant currency depreciation (Scenario I) or a sharp rise in foreign interest rates (Scenario II). Separately, we consider the possibility of using all short-term assets to cover only foreign currency short-term liabilities, and using foreign currency short-term assets to cover external principal and interest payments. The main conclusion that emerges from this exercise is that in all cases, private non-financial corporations appear most vulnerable.

Table IV.4: Aggregate Liquidity Ratios
(in percent)

Sector	2000 1/	2005 1/	Hypothetical scenarios (at end-2005) Scenario I 30 percent nominal exchange rate depreciation	Scenario II 300 bp - rise in foreign interest rates
Private financial sector				
By original maturity				
ST_Liabilities/ST_Assets	101	74	**84**	**...**
FCST_Liabilities/ST_Assets	72	64	**75**	**...**
By remaining maturity				
(ST_Liabilities + 1/3 LT_Liabilities)/ST_Assets	133	136	**150**	**...**
(FCST_Liabilities + 1/3 FCST_Liabilities)/ST_Assets	100	100	**118**	**...**
(ExtLiabilities due within a year + interest)/FCST_Assets	9.3	24.2	**...**	**24.7**
Private non-financial sector				
By original maturity				
ST_Liabilities/ST_Assets	31	44	**40**	**...**
FCST_Liabilities/ST_Assets	21	18	**19**	**...**
By remaining maturity				
(ST_Liabilities + 1/3 LT_Liabilities)/ST_Assets	80	134	**132**	**...**
(FCST_Liabilities + 1/3 FCST_Liabilities)/ST_Assets	65	99	**104**	**...**
(ExtLiabilities due within a year + interest)/FCST_Assets	18.7	16.7	**...**	**18.3**
Private Non-Financial Corporations				
By original maturity				
ST_Liabilities/ST_Assets	64	96	**91**	**...**
FCST_Liabilities/ST_Assets	47	49	**52**	**...**
By remaining maturity				
(ST_Liabilities + 1/3 LT_Liabilities)/ST_Assets	154	284	**286**	**...**
(FCST_Liabilities + 1/3 FCST_Liabilities)/ST_Assets	127	214	**229**	**...**
(ExtLiabilities due within a year + interest)/FCST_Assets	61.5	70.6	**...**	**77.8**

1/ Based on the BSA matrices in Tables 1,2

[23] Whenever the information on the remaining maturity basis is not available, we use a standard "distress barrier" assumption of (ST liabilities + 1/3 LT liabilities).

31. **This analysis can be extended and refined in several ways.** *First*, a more accurate assessment of balance-sheet vulnerabilities of non-financial firms and households would require better information about their assets and liabilities (the asset and liability positions analyzed here are derived from the banks' balance sheets and are likely to be incomplete). *Second,* one could examine different segments of the corporate sector – tradable versus non-tradable firms – that have different sensitivity of earnings to currency depreciation. It may turn out, for example, that firms with large foreign currency liabilities are mostly exporters and therefore, are naturally hedged against currency depreciation. *Third*, one could attempt to quantify the effect of currency, interest rate and debt rollover risk exposures on the overall financial health of the large Croatian corporates by computing their probabilities of default (or other measures of credit risk) using the firm-level data.

E. Conclusions

32. **The balance-sheet analysis shows that financial euroization in Croatia has increased and has become more pervasive during the period of rapid build up of external debt**. Rapid credit growth, fueled, in part, by foreign borrowing, has led to a build-up of large net liabilities in the private non-financial sector that are sensitive to changes in exchange and interest rates. These increased vulnerabilities place a premium on avoiding sharp exchange rate and interest rate movements. Given Croatia's aspirations of the EU membership, the importance of containing "transition" risks is well recognized. Some general policy implications are highlighted below:

- In the context of high euroization, sharp exchange rate changes can have significant negative balance-sheet effects. This implies that **maintaining macroeconomic stability and avoiding sharp exchange rate and asset price adjustments** should be a high priority for the Croatian government.

- **Continued fiscal consolidation** is essential to guard against further increase in public debt, particularly given its level and currency composition, as well as against further deterioration of external imbalances. It is also important for boosting the credibility of Croatia's aspirations to join the EU and adopt the euro soon thereafter.

- **Increased financial vulnerabilities imply an important role for prudential supervision**. This involves placing more emphasis on risk management by banks to guard against excessive build-up of the banks' external liabilities as well as the banks' foreign currency exposures to unhedged domestic clients.

- **Continued deepening of domestic financial markets can play a positive role as well.** For example, the development of financial instruments for hedging against currency and interest rate risk and further broadening of domestic securities markets (e.g., corporate bond market, securitizations), which would allow firms to further diversify their funding sources, could help mitigate existing balance-sheet vulnerabilities.

REFERENCES

Babic, Ante, Ivo Krznar, Danijel Nestic, and Sandra Svaljek, 2004, "Dynamic Analysis of Public and External Debt Sustainability," *Croatian Economic Survey* No 7/2004, pp. 53–104.

Berg, Andrew, Eduardo Borensztein, and Catherine Pattillo, 2004, "Assessing Early Warning Systems: How Have they Worked in Practice," *IMF Working Paper* 04/52 (Washington: International Monetary Fund).

Billmeier, Andreas, and Johan Mathisen, 2006, "Balance Sheet Risks in a Dollarized Economy—The Case of Georgia," *IMF Working Paper*, forthcoming.

Calvo, Guillermo A., Alejandro Izquierdo, and Luis-Fernando Mejia, 2004, "On the Emprics of Sudden Stops: The Relevance of Balance-Sheet Effects," NBER Working Paper No. 10520 (Cambridge, Massachusetts: National Bureau of Economic Research). Available via the Internet: http://papers.nber.org/papers/w10520.

Celasun, Oya, 2005, "Perspectives on Chile's Private External Debt," *Chile—Selected Issues*, IMF Country Report 05/316, pp. 64–82 (Washington: International Monetary Fund).

Daseking, Christina, 2004, "Thailand: An Aggregate Balance Sheet Analysis," *Thailand—Selected Issues*, IMF Country Report 04/1, pp. 5–15 (Washington: International Monetary Fund).

Deutsche Bank Research, 2005, "Croatia: Unsteady Progress on the Road to the EU", *EU Monitor: Reports on European Integration* No. 23, April, pp 12–22.

European Bank for Reconstruction and Development, 2005, *Transition Report 2005: Business in Transition,* October.

Flood, Robert P., and Nancy Marion, 2002, "Holding Reserves in an Era of High Capital Mobility," in *Brookings Trade Forum: 2001*, ed. by Susan M. Collins and Dani Rodrik (Washington: Brookings Institution Press). Available via the Internet: http://muse.jhu.edu/journals/brookings/v2001.pdf.

Government of the Republic of Croatia, *2005 Pre-Accession Economic Programme* (PEP), Zagreb, December 2005.

Halikias, Ioannis, 2004, "Assessing Ukraine's Vulnerabilities from a Balance Sheet Perspective," Ukraine—Selected Issues, pp.74–84 (Washington, International Monetary Fund).

International Monetary Fund, 2004, *Republic of Croatia: 2004 Article IV Consultation and Request for Stand-By Arrangement*, IMF Country Report No. 04/253 (Washington: International Monetary Fund).

Keller, Christian, 2004, "Analyzing a Highly Dollarized Economy from a Balance Sheet Perspective," *Peru—Selected Issues*, IMF Country Report 04/156 May, pp. 17–32 (Washington: International Monetary Fund).

Lima, Juan Manuel, Enrique Montes, Carlos Barela, and Johannes Wiegand, 2006, "Sectoral Balance Sheet Mismatches and Macroeconomic Vulnerabilities in Colombia, 1996–2003," IMF Working Paper 06/5 (Washington: International Moneary Fund).

Mathisen, Johan, and Anthony Pellechio, 2006, "Using the Balance Sheet Approach in Surveillance: Framework, Data Sources, and Data Availability," April 2006, IMF Working Paper 06/100 (Washington: International Monetary Fund).

Mathisen, Johan, and Mariana Torres, 2005, "Balance Sheet Currency Mismatch and Liquidity Analysis," *Belize—Selected Issues*, IMF Country Report 04/156, pp. 16–26 (Washington: International Monetary Fund).

Mihaljek, Dubravko, 2004, "Sustainability of Croatia's Public and External Debt," *Croatian Economic Survey*, No 7/2004, p 11–52.

Phillips, Steve, 2003, "Public Sector Finances: Balance Sheets, Financing Needs and Sustainability," *Chile—Selected Issues*, IMF Country Report 03/312, October, pp. 137–146 (Washington: International Monetary Fund).

Pitt, Alexander, 2004, "Bulgaria—External Sustainability and Vulnerability" *Bulgaria—Selected Issues and Statistical Appendix*, IMF Country Report 04/177, June, pp. 26–37 (Washington: International Monetary Fund).

Rosenberg, Christoph, Ioannis Halikias, Brett House, Christian Keller, Jens Nystedt, Alexander Pitt and Brad Setser, 2005, "Debt-Related Vulnerabilities and Financial Crises: An Application of the Balance Sheet Approach to Emerging Market Countries," IMF Occasional Paper 240 (Washington: International Monetary Fund).

Solé, Juan, Julian di Giovanni, and Edward Gardner, 2006, "Balance Sheet Analysis of Lebanon's Vulnerabilities," *Lebanon—Selected Issues*, IMF Country Report 06/200, pp. 4–15 (Washington: International Monetary Fund).

Torres, Mariano, and Johan Mathisen, 2005, "Balance Sheet Currency Mismatch and Liquidity Analysis," *Belize—Selected Issues*, IMF Country Report 05/353, September, pp. 16–26 (Washington: International Monetary Fund).

Traa, Bob, 2003, "The Balance Sheet as an Indicator of Sustainable Fiscal Policies" Ecuador—Selected Issues and Statistical Appendix, IMF Country Report 03/91, April, pp. 37–43 (Washington: International Monetary Fund).

APPENDIX I: DATA DESCRIPTION

Data Sources:

1. Central Bank. The primary source is the SRF-1SR form.

2. General Government. The main sources of government debt data are Table I3: Central Government Debt (central bank's website *www.hnb.hr*) and Table 24: Consolidated Central Government Domestic Debt in the Ministry of Finance's Monthly Statistical Reviews (Ministry of Finance website(*www.mfin.hr*.).

3. Banks. The primary source is the SRF-2SR form; in addition, Schedule BS/LM-15, Schedule BS/RD-16, Schedule: BS/BORM-17 were used to determine the value of financial claims denominated in domestic currency but indexed to a foreign currency.

4. Other Resident Sectors. Information on assets/liabilities in these cells was primarily derived from the balance sheets of other sectors.

5. Nonresident Sectors. The principal sources were Table H15: International Investment Position—Summary and its ancillary Tables H16, H17 and H18.These were supplemented by information in the Tables on Foreign Direct Equity Investments, on Gross External Debt and on International Reserves from the Croatian National Bank's website (*www.hnb.hr*).

APPENDIX II: THE CROATIAN NATIONAL BANK'S (CNB) MEASURES

Table IV.5. CNB Measures Related to Banks' Foreign Assets and Liabilities: 2000 - Present

Category	Date	Measure
General reserve requirement (GRR)	Dec-00	Foreign currency RR lowered from 55 percent and unified with kuna RR at 23.5 percent (GRR).
	Sep-01	GRR reduced to 22 percent.
	Nov-01	GRR reduced to 19 percent.
	Oct-04	GRR reduced to 18 percent.
	Jan-06	GRR reduced to 17 percent.
Marginal reserve requirement (MRR)	Aug-04	MRR introduced at 24 percent on borrowing larger than base of June 2004.
	Feb-05	MRR increased to 30 percent.
	May-05	MRR increased to 40 percent.
	Jan-06	MRR raised to 55 percent: 40 percent of any increase in foreign debt compared to initial debt balance in June 2005 and 15 percent of increase after November 2005. Broader base including bank guarantees for corporate external borroiwng and bank borrowing from domestic leasing companies.
	Mar-06	MRR extended to issuance of bonds by commercial banks.
Liquid assets ratios (LAR)	Feb-03	Minimum foreign currency liquid asset to foreign currency liabilities of 35 percent.
	Feb-05	LAR cut to 32 percent.
	Mar-06	From March 1 to October 31, 2006 banks to include in liquid assets their participation in €400 million loan to government.
	Oct-06	32% of foreign exchange liabilities must be covered by short-term foreign exchange assets with a maturity of less than 3 months; foreign exchange liabilities were expanded in order to include liabilities in kuna with a currency clause.
Risk weights	Mid-2006	Increase capital adequacy risk weights by 25 basis points on foreign currency or foreign currency-indexed loans to unhedged borrowers in nongovernment sector.

Source: Croatian National Bank (CNB).

V. BANK STABILITY AND CREDIT RISK IN CROATIAN BANKS[1]

A. Introduction

1. **The 2006 Article IV mission to Croatia takes place at a time when private sector credit growth has started to accelerate again.** Both household and enterprise credit have recently been growing at 20 percent, year-on-year, with the share of household credit gaining prominence in total credit (Figure V.1).

2. **Credit booms can disguise underlying problems. This is because they can make banks complacent about the quality of their loan books, as they relax lending standards in their fight for market share during favorable macroeconomic conditions.** At the same time, overall nonperforming loans, in percent of total loans, tend to look benign due to low default rates and high loan growth. Meanwhile, both good business and low provisioning (for loan-loss) levels tend to result in banks recording high profitability. But a key question remains: to what extent could banks be hurt by credit risk materializing once favorable macroeconomic conditions subside.

3. **The purpose of this paper is to quantify the impact on Croatian banks' capitalization of the possibility of macroeconomic conditions becoming less favorable**. The impact depends on two important considerations. The first is the sensitivity of bank reserves for loan-losses (i.e., emerging credit risk) to changes in economic circumstances (proxied in this paper by real GDP growth and the unemployment rate). The second is the extent to which banks have already built up stability-enhancing buffers in anticipation of future credit risk. A related issue is whether fast-growing banks have higher credit risk.

4. **Analysis based on annual macroeconomic and bank-by-bank data for Croatia (or, for that matter, any other single country in the region) would not give very reliable and meaningful results.** This is due to an insufficient number of observations, spanning at least one business cycle. Therefore, this paper pools observations from Croatia and other countries in the region to quantify the average response of banks to changing macroeconomic conditions.2 Then, it uses this average response to calculate the effect of a downturn in economic conditions on the capitalization of Croatian banks. This would seem to be a reasonable approach as a large proportion of the banks in the countries in the sample are foreign-owned (especially by Austrian and Italian banks), like in Croatia.

---

[1] Prepared by Srobona Mitra.

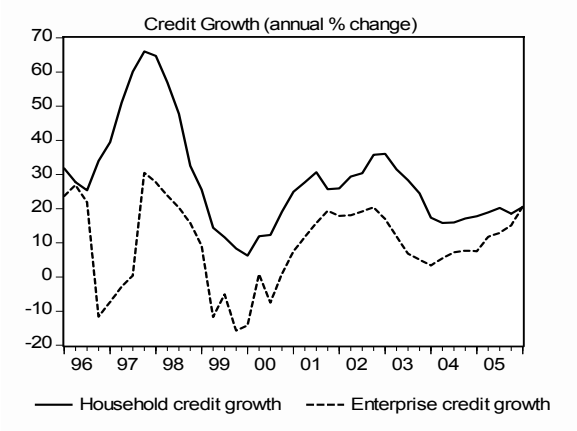
[2] In Croatia, almost 80 percent of loans are in foreign currency or in kuna indexed to foreign currency. A substantial portion of these loans are made to unhedged clients, raising implications for credit risk in the event of a large depreciation. Thus, while an analysis of the foreign exchange induced credit risk implications of large movements in the exchange rate would have been desirable, the closely managed exchange rates maintained in most countries in our sample precluded such analysis.

5. **We use a simple model, found elsewhere in the literature, for jointly estimating credit risk and bank stability in the countries in Emerging Europe (EE).**3 In the model, loan-loss reserves proxy for credit risk and the so-called z-index measures bank stability. Box V.1 describes the relationship between loan-loss reserves and credit risk in some detail. In estimating how changes in economic conditions affect loan-loss reserves and how these reserves then affect stability, the above-mentioned equations explaining bank stability and loan-loss reserves are estimated in a three-stage least squares framework to eliminate potential biases and to exploit efficiency-gains when there are feedback effects between the two equations. We repeat the exercise for EU15 countries—comprised of the Euro Area, Sweden, Denmark, and the United Kingdom—to see if EE banks behave differently and, if so, to explore how this affects their need to create additional reserves in the event of a downturn.

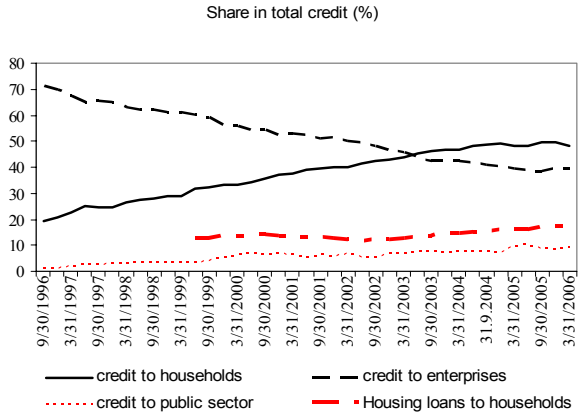
[3] Maechler, Mitra, Worrell (2006) discusses provisions and bank stability in a single equation framework, and Tamirisa and Igan (2006) and Cihak and Tamirisa (2006) discuss the relationship between credit growth and bank stability in a two-equation three-stage least squares framework.

Figure V.1 Credit Growth in Croatian Banks—Selected Characteristics

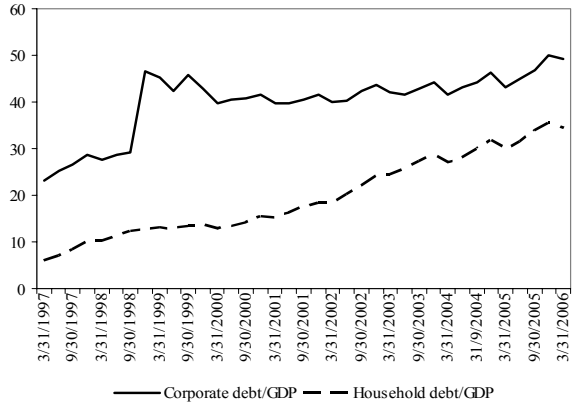
Credit growth has picked up to 20 percent y-o-y for both households and corporate credit...



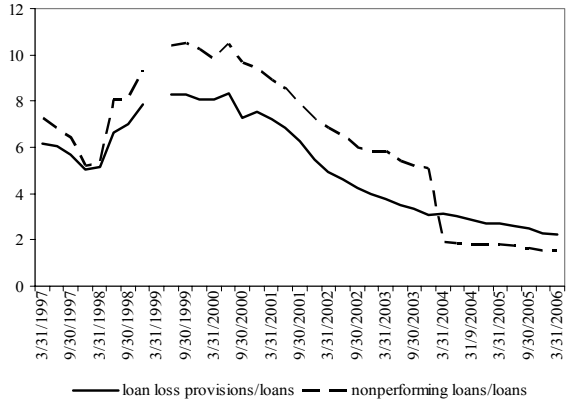
...with an increasing share of household credit .



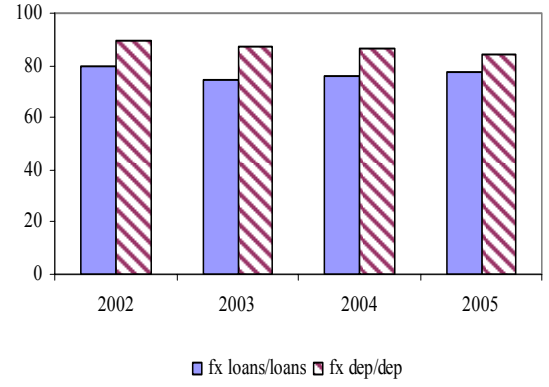
Non-bank private sector debt levels are steadily rising...



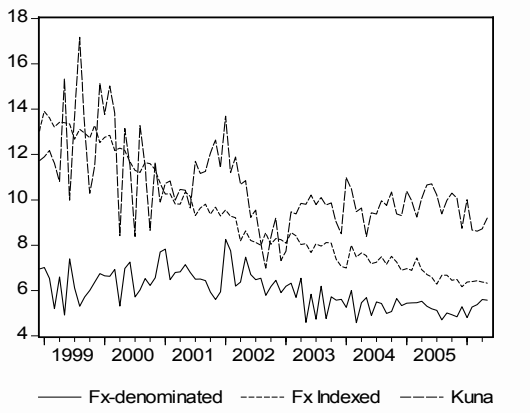
...but it appears that asset quality of banks has continued to improve.



The loans and deposits are mostly in fx or linked to fx...



...and fx-linked lending rates have trended down.



Source: CNB, IFS, Staff calculations.

Box V.1. Loan-Loss Reserves and Credit Risk

Loan-loss provisions and loan-loss reserves: Loan-loss reserves are made against expected losses. Additions to loan-loss reserves are called loan-loss provisions. They are deducted from profits, and are made on a specific loan-by-loan basis and on pools of similar types of loans. These provisions are deducted from the loans on the asset side of the balance sheet, and are charged against profits, thus reducing retained earnings, hence capital. Both types of provisions adjusted for actual write-offs on loans are flow variables that add to the total loan-loss reserves. Any additional unexpected loss on loans is met from capital. In some countries, a percent of the loan-loss reserves is included under regulatory capital. Creating an adequate cushion is necessary if a capital crunch is to be avoided during high loan-loss events. Under International Financial Reporting Standards (IFRS), however, provisions can only be made when loans are actually impaired.

Loan quality, provisions and interest rate on loans: The current value of a loan is equal to the present discounted value (pdv) of the expected future cash flows generated by the loan, which is given by the contracted interest and principal payments *less* the expected value of losses from the non-repayment of the contracted amounts (Borio, Furfine and Lowe, 2001). However, the contracted interest rate can further be divided into the risk-free rate *plus* a default premium. Thus, the current value of the loan, V_t, can be written as:

$$V_t = F_t + \sum_j \frac{E(d_j)}{(1+r)^{j-t}} - \sum_j \frac{E(l_j)}{(1+r)^{j-t}}$$

where F_t is the face value of the loan, d is the default premium and $E(l)$ is the expected loss from non-repayment of the contracted amounts. Loan-loss provisions try to provide a cushion to bridge the difference between the face value and the current value of the loan— $F_t - V_t$. Thus, provisions are necessary to cover expected losses if the default premium charged to the borrower is insufficient to cover future losses.

But there can be a few reasons for the default premium to be underestimated, thus underpricing credit risk:

- Banks competing for market share could relax lending standards.
- Long-term lending or a multi-dimensional relationship with a borrower could cause banks to charge less.
- In a partially euroized country with high fx lending and a closely managed exchange rate peg, banks expect the central bank to maintain the exchange rate in the future, thus underpricing fx-related credit risk.

In the event default premiums are underestimated, banks do not necessarily create the appropriate provisions: This is because of several reasons:

- Additional provisions cut into current profits so banks can be reluctant to use them.
- Accounting practices, especially International Accounting Standards, allow specific provisions to be made only for identified impairments. After adopting IFRS, although CNB reduced provisions to match identified losses, it raised provisions for unidentified losses.
- Higher collateral values, buoyed by real estate booms, necessitate lower provisioning.
- Croatian law allows banks to access borrowers' wages in case of a credit event. However, such 'wage collaterals' could vanish if the borrower becomes unemployed.

One way of getting around the limitations posed by the accounting and tax regimes is to create buffers from capital instead. The provisions required to cover all future expected losses could be matched to the amount of capital buffers that can be set aside for the same purpose. Appropriately increasing risk weights is one way to do this.

6. **There are four main findings of the paper:**

(1) For the EE, banks' loan-loss reserves in percent of loans is procyclical—rising with a decline in real growth rates and higher unemployment rates and vice versa. This is in line with existing empirical evidence that many banks around the world delay provisioning for bad loans until cyclical downturns have already set in and it is too late (Laeven and Majnoni, 2003). Procyclicality exacerbates the business cycle—a recession is aggravated by a credit crunch stemming from a steep rise in loan-loss reserves affecting capitalization. The evidence of procyclicality is less strong in the case of the EU15: while loan-loss reserves react to the unemployment rate, they do not react to the real growth rate.[4]

(2) The results are consistent with more stable and better managed banks needing to provision less, a result with intuitive appeal that thereby adds to the credibility of the empirical work.

(3) Rapid credit growth does not necessarily lead to higher loan-loss reserves, unless credit growth is accelerating.

(4) The adverse effect of worsening macroeconomic conditions on the capitalization of Croatian banks could be quite high. If the Croatian banks were to behave more like the EU15 banks, the adverse effect would be much less.

The rest of the paper is organized as follows. Section B tracks various interest rates on customer loans to get a sense of the credit risk component built into Croatian interest rates. Section C outlines the data and the econometric model and Section D discusses the results. A back-of-the-envelope credit risk calculation, based on the econometric results, is made in Section E. Concluding remarks, including policy implications for Croatia, are made in Section F.

B. Interest Rate Spreads and Credit Risk Premium

7. **In this section, we analyze trends in different interest rate spreads to try to extract information on credit risk perceptions by Croatian banks of lending to different sectors.** In particular, while recognizing that household and corporate loan products can vary widely, this section looks at the difference in same-currency loan rates for these sectors. Differences between general household loans and mortgage loans to households are examined first.

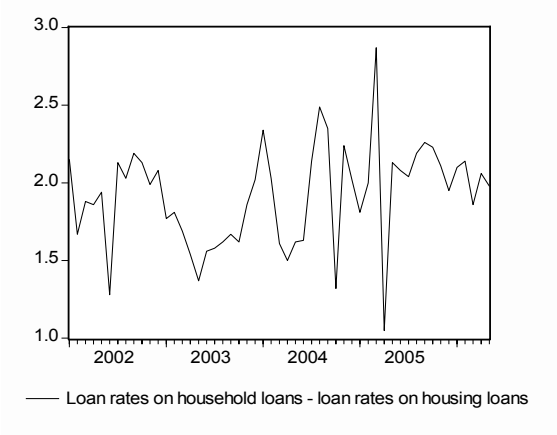
[4] The paper discusses later (in Section C) why changes in real growth rate and the unemployment rate can be expected to generate different responses.

8. **Loans based on house mortgages have a lower interest rate due to their relatively low risk.** This is especially the case when house prices are increasing and banks perceive risks to be lower due to higher collateral values. Indeed, the excess credit risk on non-housing household loans is close to 2 percentage points in 2006 for Croatia. However, the data does not distinguish loan rates by currency.

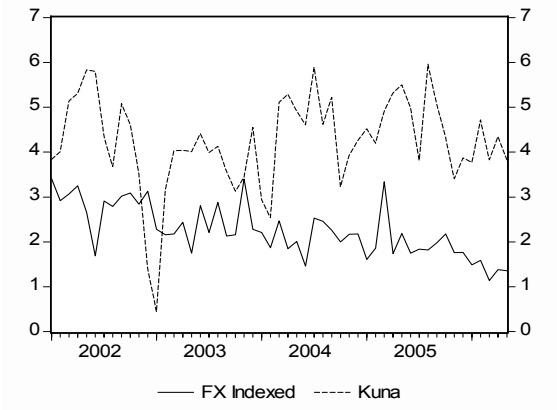
9. **Household credit risk seems underpriced when judged against corporate lending.** Difference between loan rates for households and corporates should reflect two factors: excess risk in household lending, especially in fx or fx-indexed lending to unhedged customers; and the market power of banks over households since typically firms can access foreign funding sources but households cannot. The difference between fx-indexed loan rates to households and corporates has trended down, and is currently close to zero for short-term loans, and a little over 1 percentage point for long-term loans. A reasonable assumption is that more corporates are naturally hedged than households, so it is somewhat surprising that the long-term fx-indexed loan rate difference is so low. Moreover, the credit risk premium is especially low if allowance is made for a premium for banks' market power over households.

This evidence suggests that banks might not be pricing in the higher credit risk embedded in household foreign exchange indexed loans.

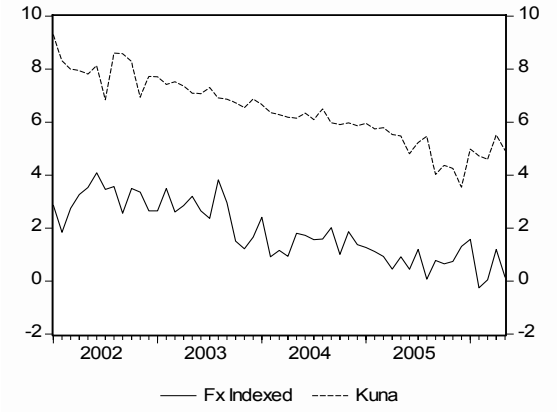
Spread between different household loans



Differences in long-term loan rates to household and enterprises



Differences in short-term loan rates to household and enterprises



Source: CNB, Staff calculations

C. The Model and Data

The model

10. **Bank stability is defined by the z-index (De Nicolo 2000, Boyd, De Nicolo and Al Jalal 2006).** A widely used measure of bank soundness, the z-index is directly related to the probability of loss exceeding equity capital and thus measures the risk of insolvency or distance to default. It can be summarized by:

$$z \equiv \frac{\mu + k}{\sigma}$$

where μ is the average return on assets (in percent), k is equity capital as a percent of assets, and σ is the standard deviation of the returns on assets as a proxy for return volatility.[5] Statistically, z measures the number of standard deviations a return realization has to fall in order to deplete equity, under the assumption of normality of banks' returns. A *higher* level of z implies a lower probability of insolvency risk, or higher stability.

11. **Two alternative measures of the z-index are used.** The measures differ only in the calculation of σ. One measure, log(z_md), uses the mean-deviation of profitability (i.e., the absolute deviation of μ from the bank-specific mean of μ) as a proxy for returns-variability. This is used in Boyd, De Nicolo and Al Jalal. The other, log(z_rol), uses a 3-year rolling standard deviation of μ for returns-volatility as used in Maechler, Mitra, and Worrell (MMW, forthcoming) . The first allows us to use more observations than the second, but could result in a larger variability in returns if μ moves from negative to positive or vice versa. The second measure smoothes out such variability, but may induce serial correlation in the data.

12. **Loan-loss reserves in percent of total loans is used as a measure of provisioning.** The stock version of provisions is used instead of the flow version to take into account the net impact of provisioning flows and loan write-offs on the loan-loss reserves in any period at a particular bank (Box V.1).[6] Since the series loan-loss reserves/loans ranges from 0 to 100, it is logit-transformed to ensure a normal distribution.[7]

---

[5] Typically, the market values of equity and assets and shareholders' profits should be taken to calculate this index. However, due to lack of data on market capitalization of most of the banks in our sample, we have taken the book values of all variables derived from balance sheet data.

[6] Loan-loss reserves(t)=loan-loss reserves(t-1) + new charges to provisions(t) through the profit and loss accounts - (write-offs(t) - recoveries(t)) + currency and other adjustments(t).

[7] The logit transformation of x (in percent) is log(x/(100-x)).

13. **The econometric model assumes that loan-loss reserves are made against either expected or realized loan-losses, for which macroeconomic conditions are key factors.** If loan-loss reserves are built up in advance in anticipation of a downturn, then they would not show up empirically as reacting procyclically—that is, reserves would not increase when the economic downturn sets in. We use the lagged z-index as a proxy for profit and capital buffers built up in advance and for a bank's sound credit risk management policies. These considerations would seem to affect current loan-loss reserves. Noting that bank stability could, in turn, be affected by past loan-loss reserves, we set up a model that jointly estimates bank stability and loan-loss reserves in a systems framework adopting the methodology used in Tamirisa and Igan (2006) and Cihak and Tamirisa (2006).

14. **The 3SLS framework allows us to estimate the equations jointly, even though neither of the equations seem to have endogenous variables on the right hand side.** The endogeneity problem is taken care of by the inclusion of a lag of the other dependent variable on the right hand side. Still, given that the residuals of the 3SLS regressions are significantly correlated (albeit with a correlation coefficient < 0.1), we proceed with 3SLS rather than 2SLS because the former is more efficient. The inclusion of the lagged dependent variable on the right hand side could potentially give rise to endogeneity problems if the errors are serially correlated. But serial correlation was not found in the residuals.

15. **The selection of the explanatory variables is based on the empirical literature and practical experience, and** reflects **those most likely to have an effect on the dependent variables.** The two equations used in the systems estimation are:

Equation 1—Bank Stability:

$$z_{ijt} = f(z_{ijt-1}(+), \text{Loan-loss reserves/loans}_{ijt-1}(+/-), \text{Real GDP growth}_{jt-1}(+), \text{Credit/GDP}_{jt-1}(+), \text{Total Asset Growth}_{ijt-1}(+/-), \text{cost/income}_{ijt}(-)) + u_{ijt}$$

Equation 2—Loan-loss reserves:

$$\text{Loan-loss reserves/loans}_{ijt} = f(z_{ijt-1}(-), \text{Loan-loss reserves/loans}_{ijt-1}(+), \text{Real GDP growth}_{jt-1}(-), \text{Unemployment rate}_{jt}(+), \text{loan-growth}_{ijt-1}(-), (\text{loan-growth}_{ijt-1})^2(+)) + v_{ijt}$$

i = bank index
t = year index 1997-2004 for Emerging Europe; 1996-2004 for EU15.
j = country index, covering Emerging Europe, EU15 countries.

16. **Equation 1 estimates a parsimonious representation of the models used in MMW and Tamirisa and Igan.** Bank stability varies between banks, across countries, and through time. We use the natural logarithm of z . The expected signs of the explanatory variables, shown in the equation representations above, are explained below.

- A *lagged z* is used as a RHS variable to take into account that buffers built up in the previous period and good risk management policies help deliver stability through time. We expect the sign to be positive.

- The variable *lagged loan- loss reserves/loans* reflects the reserves built in the previous period. It is expected to increase stability over and above the effect of better risk management policies and other buffers built up in the previous period as captured by the coefficient on lagged z. But previous empirical evidence (MMW) was ambiguous about the effect of loan-loss reserves on bank stability.

- Higher *real GDP growth* in the last period reflects favorable macroeconomic conditions that could help bank stability...

- ...as does higher financial depth achieved through higher *credit/GDP* ratio.[8]

- High bank-by-bank *asset growth* has an ambiguous effect on stability, depending upon the quality of such growth and its effect on volatility of earnings for the individual bank. Previous evidence (Tamirisa and Igan) has shown that even though credit growth has not deteriorated financial soundness in banks, future risks to bank stability could materialize due to the increase in the extension of credit by inherently weak banks.

- The *cost-to-income* ratio is included as a bank-efficiency indicator: lower efficiency of a bank (represented by a higher cost-to-income) is associated with lower stability.[9]

17. **The dependent variable for Equation 2 is loan-loss reserves/loans, with the various explanatory variables explained below.**

- *Lagged loan-loss reserves/loans* is expected to be a significant determinant of current loan-loss reserves/loans, because reserves are usually built up over time.

- Higher bank stability in the previous period, represented by *lagged z*, would necessitate lower loan-loss reserves this period because less of a buffer is needed when a bank is comparatively more stable.

- Deteriorating macroeconomic conditions are expected to result in higher loan-loss reserves, if loan-loss reserves are typically procyclical—that is, reserves were not

[8] Note that this variable varies between countries but not between banks within the same country; thus it does not have an i subscript.

[9] The cost-to-income ratio, a flow concept, includes provisioning charges. This is the reason for its lagged response to recessions.

built up in advance in anticipation of deteriorating macroeconomic conditions. Both real GDP growth rate and the unemployment rate are used to reflect macroeconomic conditions. Although there should be a high correlation between these two variables, both are included (with different lags) to reflect the almost equal presence of both household and corporate borrowers. While corporates are more sensitive to GDP growth rates, households are expected to be more sensitive to the unemployment rate. Thus the sensitivity of loan-loss reserves to *lagged real GDP growth (current unemployment rate)* is expected to be negative (positive).

- Higher *loan growth* is expected to lower loan-loss reserves, due to the increasing base, but ...

- ...the rate of acceleration of loan growth—given by the coefficient on the *square of loan growth*—would necessitate higher loan-loss reserves.

Data

18. **The paper uses bank-by-bank annual data from Croatia, Emerging European (EE) countries, and EU15 states.**[10] The data on the macroeconomic variables are obtained from the IMF's International Financial Statistics. The bank-by-bank data comes from Bankscope for all the countries in the sample, for 1997–2004 (1996–2004 for EU15). Instead of looking at Croatia in isolation—given the short length of its time series—we look at the group of countries comprising Emerging Europe to estimate the model, in order to incorporate information from average macroeconomic cycles.[11] Summary statistics of the dependent variables are provided in Table V.1.

19. **Bank-by-bank data and macroeconomic data show wide variations between yearly averages for Croatia and yearly averages for the rest of Emerging Europe (Figure V.2) and the EU15 (Figure V.3).**

- In Croatia, bank stability, as measured by z, has increased over the years, with the peak (in 2001) coinciding with the average Emerging Europe peak. Bank stability

[10] For the EE countries, we use the dataset used in MMW.

[11] In order to include episodes involving more traditional macroeconomic cycles, we tried including data on banks from Spain, Portugal and Greece, countries that are so-called non-core EU members. However, including these countries did not affect the estimates significantly. Thus the results including these three countries are not reported separately.

seems to have declined for the EU15 banks over the sample period probably reflecting higher volatility of profits.[12]

- The variable loan-loss reserves/loans in Croatia has gradually declined since 2000; it has also declined almost continually in other Emerging and EU15 countries since 1998. In the EU15, however, this variable had started from and declined to a lower level than the Emerging Europe averages.

- While bank-by-bank loan growth in Croatia has generally moved in parallel with other parts of Emerging Europe, the growth in Croatia has mostly been lower. Loan growth in EU15 banks took off quite dramatically following recovery from the 2000 U.S. tech bubble burst—a take off that coincided with loan growth in Emerging European and Croatian banks. The loan growth was helped by easing global liquidity conditions and low interest rates. But, even at its peak, loan growth in EU15 banks was only a fraction of that in Croatian and Emerging European countries. The difference is largely due to higher levels of intermediation already achieved by the EU15 banks compared to the others.

- Bank efficiency—measured by cost/income ratio—has continually improved since 2000, but this ratio in Croatia remains above Emerging Europe averages.

- Finally, there are two observations about the real economic cycle: First, although real GDP growth rates bounced back from adverse developments in 1999 in Croatia, the unemployment rate only started improving from 2002 onwards. This suggests that changes in the unemployment rate may have been mostly structural and therefore unrelated to cyclical fluctuations in real GDP. Second, the real GDP growth in the EU15 was adversely affected by the tech bubble burst in 2000; growth in Emerging Europe, especially Croatia, was not. The depressed growth rates in the EU15 that followed, along with easing global liquidity conditions, could have been instrumental in pushing EU15 funds into their Emerging European bank subsidiaries to exploit their relatively favorable business conditions, thus partly contributing to rapid credit growth in the region.

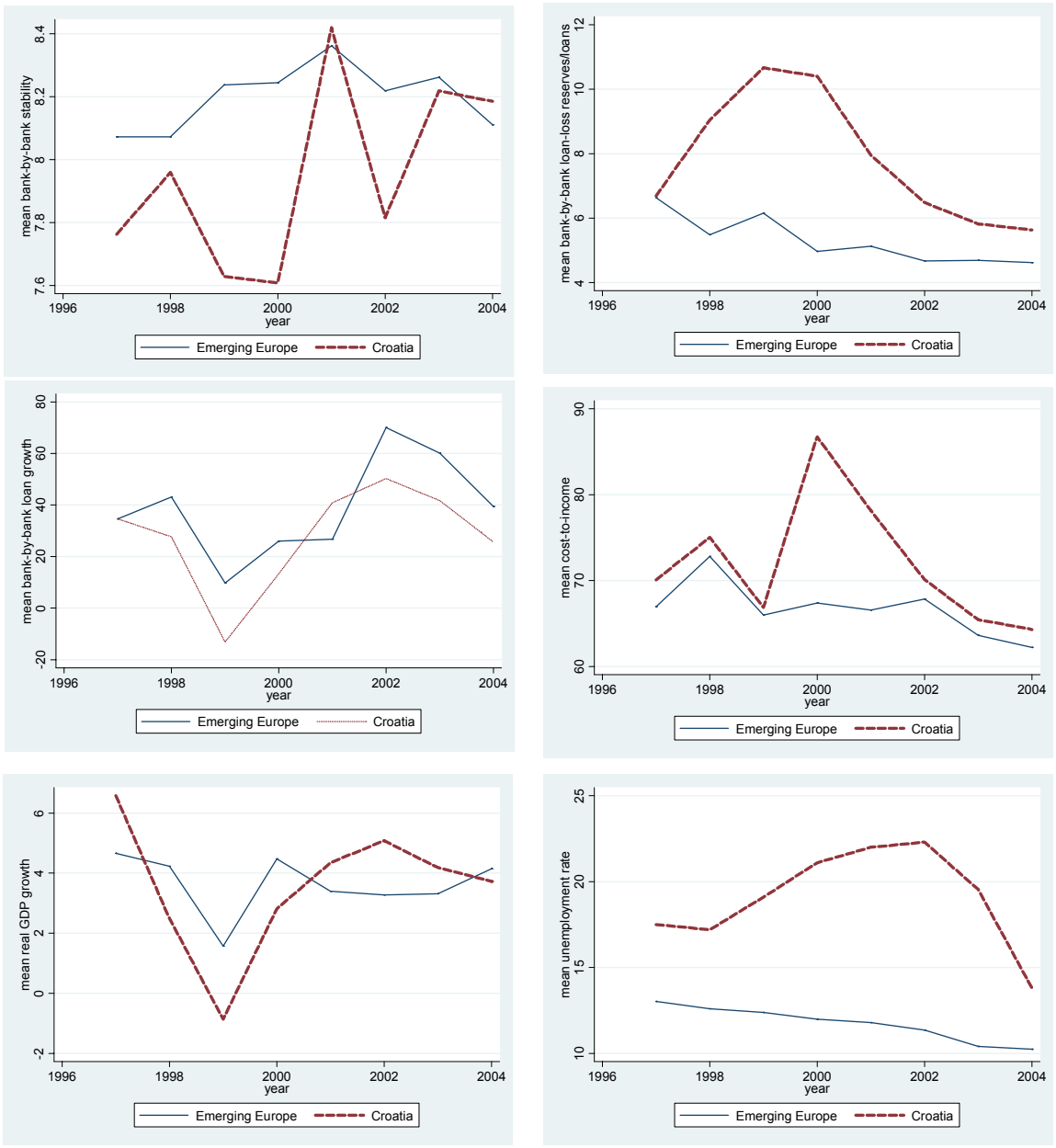
[12] This is consistent with the finding in De Nicolo and Tieman (2005) who find, using market based indicators, that financial risk in large European banks has not declined in the past 15 years.

Table V.1. Summary Statistics of the Dependent Variables 1/

Country groups	Obs	Mean	Std. Dev.	Min	Max
			Log z_md		
Croatia	172	7.96	1.54	3.49	11.81
EE except Croatia	993	7.74	1.51	1.50	13.97
EU15	3582	6.05	1.52	-1.38	21.22
			Log z_rol		
Croatia	141	3.66	1.19	0.56	6.96
EE except Croatia	644	3.23	1.25	-2.85	7.01
EU15	2803	8.50	1.14	1.99	12.35
			loan-loss reserves/loans (%)		
Croatia	169	7.70	5.33	0.00	27.66
EE except Croatia	897	7.00	9.31	0.00	100.00
EU15	2046	3.82	5.84	0.00	93.51
			Logit-transformed loan-loss reserves/loans		
Croatia	167	-2.68	0.73	-4.48	-0.96
EE except Croatia	875	-3.12	1.20	-8.11	2.02
EU15	1977	-3.77	1.25	-9.21	2.67

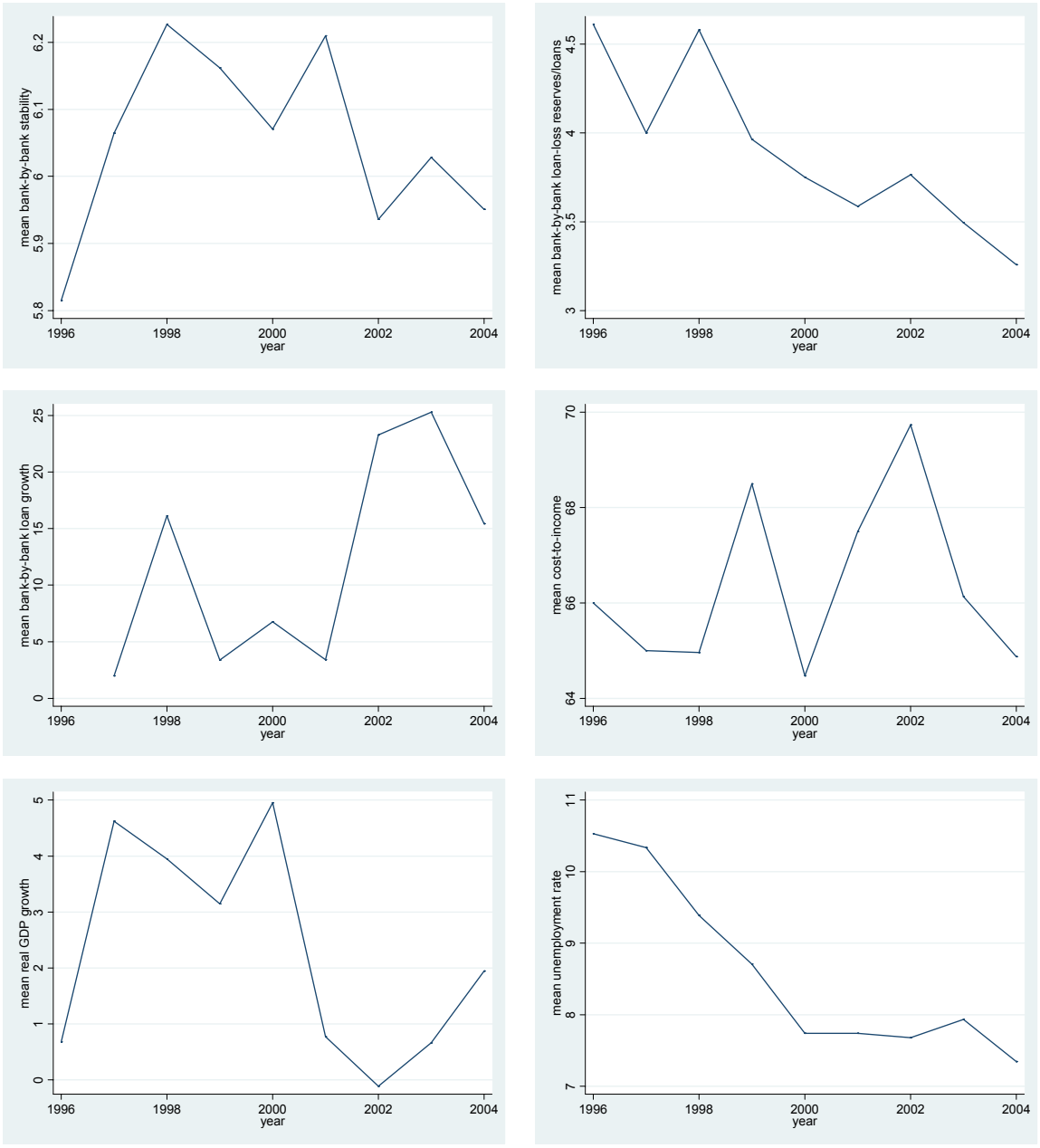
1/ EE refers to Emerging Europe. EU15 refers to the Euro Area countries, Denmark, Sweden and the U.K.

Figure V.2. Emerging Europe and Croatia—Mean of Key Variables by Year 1/



Source: Bankscope, Staff estimates.
1/ Pooled mean of bank-specific variables by year for Emerging Europe and Croatia.

Figure V.3. EU15—Mean of Key Variables by Year 1/



Source: Bankscope, Staff estimates.
1/ Pooled mean of bank-specific variables by year for the EU15.

D. Results

20. **The results for Emerging Europe are given in Table V.2 and those for EU15 are in Table V.3.** Columns 1 and 2 use one measure of z (log z_md) and columns 3 and 4 use the other measure (log z_rol). The key results are as follows:

- *More stable banks are susceptible to lower credit risk.* A bank that was more stable last period—already having built a buffer against risk through good risk management policies—could do with less loan-loss reserves this period; this is especially significant if log(z_rol) is used as a stability measure. This finding is given by the negatively significant coefficient for lagged z (column 4) in Equation 2, both for Emerging Europe and EU15. Past loan-loss reserves have an ambiguous effect on stability (similar to the findings in a single equation framework in MMW).

- *Loan-loss reserves increase with adverse macroeconomic fluctuations for the Emerging Economies, but the increase is less for EU15.*[13] While the EE banks' loan-loss reserves increase with a fall in lagged real GDP growth and a rise in the current unemployment rate, the EU15 banks only respond to the unemployment rate. The reason for the latter response of the EU15 banks could be their better preparation—in terms of credit risk management and provisioning—for cyclical downturns.

- *Higher loan growth is associated with lower loan-loss reserves, but accelerating loan growth eventually leads to higher loan-loss reserves.* This quadratic relationship is robust across country groups and specifications.

- *There is weak evidence of higher asset growth in the previous period lowering bank stability.* This result could be driven by higher volatility of profits associated with higher asset growth, which in turn lowers stability indicators.

- *Efficiency enhances stability.* This observation emerges from the negative relationship between cost-to-income and the z-index.

[13] Kraft (2004) finds a negative association between (lagged) real GDP growth rates and loan-loss provisions over 1998-2003 for a panel of Croatian banks.

Table V.2. 3SLS Estimates of Bank Stability and Credit Risk—Emerging Europe 1/

Explanatory variables	Emerging Europe (EE) Dependent variables		Emerging Europe (EE) Dependent variables	
	Equation 1 bank stability 1	Equation 2 loan-loss reserves 2	Equation 1 bank stability 3	Equation 2 loan-loss reserves 4
z_{ijt-1} *(log z_md)*	0.426**	-0.01		
	(12.04)	(0.33)		
z_{ijt-1} *(log z_rol)*			0.613**	-0.049*
			(17.61)	(2.19)
Loan-loss reserves/loans$_{ijt-1}$	-0.01	0.750**	0.078+	0.711**
	(0.23)	(30.15)	(1.90)	(24.60)
Credit/GDP $_{jt-1}$	0.00		0.00	
	(0.63)		(1.12)	
Total Asset Growth$_{ijt-1}$	-0.003+		0.00	
	(1.74)		(0.54)	
Real GDP growth$_{jt-1}$	0.01	-0.025*	0.02	-0.033**
	(0.43)	(2.57)	(1.22)	(2.94)
Unemployment rate$_{jt}$		0.015**		0.016**
		(3.50)		(3.47)
loan-growth$_{ijt-1}$		-0.003**		-0.002**
		(4.26)		(3.01)
(loan-growth$_{ijt-1)}^2$		0.000**		0.000**
		(4.24)		(3.64)
Cost-to-income	-0.009**		-0.005**	
	(4.48)		(4.17)	
Constant	4.998**	-0.869**	1.872**	-0.859**
	(13.45)	(5.53)	(9.08)	(6.40)
Observations	550	550	452	452
"R^2"	0.26	0.73	0.49	0.69

1/ Absolute value of z statistics in parentheses+ significant at 10%; * significant at 5%; ** significant at 1% Adding dummies for specific country clusters--like south eastern European or the ten recently acceded EU member states--did not change the results.

Table V.3. 3SLS Estimates of Bank Stability and Credit Risk—EU15 1/

	EU15 Dependent variables		EU15 Dependent variables	
Explanatory variables	Equation 1 bank stability	Equation 2 loan-loss reserves	Equation 1 bank stability	Equation 2 loan-loss reserves
	1	2	3	4
z_{ijt-1} *(log z_md)*	0.299**	-0.003		
	(10.54)	(0.31)		
z_{ijt-1} *(log z_rol)*			0.650**	-0.027+
			(29.99)	(1.78)
Loan-loss reserves/loans$_{ijt-1}$	-0.008	0.876**	-0.034+	0.835**
	(0.23)	(61.09)	(1.72)	(57.27)
Total Asset Growth$_{ijt-1}$	-0.004*		-0.0004	
	(2.37)		(0.42)	
Real GDP growth$_{jt-1}$	-0.002	0.006	-0.012+	0.001
	(0.18)	(1.20)	(1.72)	(0.25)
Unemployment rate$_{jt}$		0.016**		0.016**
		(3.51)		(3.47)
Unemployment rate$_{jt-1}$	0.008		0.004	
	(0.74)		(0.73)	
loan-growth$_{ijt-1}$		-0.001+		-0.002*
		(1.87)		(2.51)
(loan-growth$_{ijt-1)}^2$		0.000**		0.000*
		(3.07)		(2.20)
Cost-to-income	-0.013**		-0.003**	
	(5.40)		(3.60)	
Constant	5.224**	-0.602**	3.059**	-0.487**
	(16.84)	(5.92)	(13.60)	(3.22)
Observations	1235	1235	1161	1161
"R^2"	0.13	0.79	0.47	0.77

1/ Absolute value of z statistics in parentheses; + significant at 10%; * significant at 5%; ** significant at 1%. EU15 comprises the Euro Area, Denmark, Sweden and the United Kingdom.

E. A Back-of-the-Envelope Calculation of Credit Risk in Croatian Banks

21. **The estimates obtained in Tables V.2 and V.3 can be used to calculate the effect of a down cycle on Croatian banks' capitalization.** To keep the analysis simple, a downturn is defined as a reduction in real GDP growth in isolation or in combination with an increase in the unemployment rate.

22. **The following steps are followed.** First, based on the regression estimates for the loan-loss reserve equation for Emerging Europe in Table V.2, we calculate the sensitivity of loan-loss reserves/total loans of Croatian banks to a 1-unit or 1-percentage point adverse change in the real GDP growth rate and/or the unemployment rate. Second, we take total assets for each bank, as a proxy for total loans, and calculate the amount of increase in reserves based on total assets of each bank. [14] Third, this increase in nominal reserves is deducted from both regulatory capital and risk-weighted assets to come up with the new capital adequacy ratio (CAR). Fourth, we repeat the previous steps based on the EU15 estimates shown in Table V.3. The results of this exercise are shown in Tables 4 and 5. The Appendix provides more details.

23. **Notwithstanding the potential overestimation of credit risk, the results raise the prospect of Croatian banks being very sensitive to adverse changes in the economic cycle.**[15] As Table V.4 shows, even a one standard deviation change in real GDP growth and unemployment rates could push several banks, accounting for almost 49 percent of total banking system assets, below the 10 percent minimum CAR. The adverse effect is manifold if the extreme historical realizations—a very low-probability event—for Croatia are considered.

24. **The adverse effect on the capitalization of the Croatian banks would be much less if these banks behaved more like EU15 banks.** To run this counterfactual analysis, the regression estimates from the EU15 banks (Table V.3) are used to calculate the effect on Croatian banks' capitalization in the event of adverse economic conditions. The results (Table V.5) show that for one-percentage point changes in the real GDP growth rate and the unemployment rate, the post-shock CAR is much higher than when the estimates from the EE case are used (Table V.4)—only banks accounting for a little over 1 percent share of assets fall below the minimum CAR. This result—and other results in Table V.5—is driven by the fact that EU15 banks seem to create larger buffers in advance of real GDP downturns,

---

[14] The analysis can easily substitute total loans for total assets, once bank-by-bank data on total loans is available. We use bank-by-bank data published on the CNB website as of June 30, 2006.

[15] Some overestimation could be due to the following: (i) total assets are used instead of total loans, which inflates the nominal amount of increase in reserves; and (ii) banks could vary widely in the quality of their loan portfolio in light of their individual provisioning policies and existing buffers. In other words, banks with a higher z-index would have to make less reserves than shown in Table V.1.

lessening the need to increase them when the actual downturn sets in. However, the EU15 banks do react significantly to changes in the unemployment rate, perhaps due to the relatively recent boom in mortgage credit to households, the sector that would be more sensitive to the unemployment rate. This is why Croatian banks, in this latter exercise, would still be highly affected if the extreme historical realization for unemployment were to occur. But even then, the post-shock CAR for the aggregate banking sector would still be much higher than the post-shock CAR in Table V.4.

Table V.4. Change in Loan-Loss Reserves/Loans in Response to Adverse Economic Cycle—Based on Emerging Europe Regression Estimates

Type of change in the real GDP growth rate and the unemployment rate	Change (from 2006 baseline) in		Change in loan-loss reserves/loans due to		Old aggregate CAR (as of June 30, 2006)	New aggregate CAR	Banks below 10% CAR (in % share of total assets of banking system)
	Real GDP growth rate	Unemployment rate	Change in Real GDP growth rate	Change in Unemployment rate			
Unit change	-1.00	1.00	0.65	0.39	12.88	11.70	22.50
1 s.d. change 1/	-2.06	2.66	1.34	1.04	12.88	10.00	48.90
Historical extreme 2/	-5.36	9.10	3.49	3.55	12.88	3.90	97.65

Table V.5. Change in Loan-Loss Reserves/Loans in Response to Adverse Economic Cycle—Based on EU15 Regression Estimates

Type of change in the real GDP growth rate and the unemployment rate	Change (from 2006 baseline) in		Change in loan-loss reserves/loans due to		Old aggregate CAR (as of June 30, 2006)	New aggregate CAR	Banks below 10% CAR (in % share of total assets of banking system)
	Real GDP growth rate	Unemployment rate	Change in Real GDP growth rate	Change in Unemployment rate			
Unit change	-1.00	1.00	0.00	0.47	12.88	12.30	1.20
1 s.d. change 1/	-2.06	2.66	0.00	1.25	12.88	11.40	22.50
Historical extreme 2/	-5.36	9.10	0.00	4.29	12.88	7.60	94.50

1/ One-standard deviation of real GDP growth rate and unemployment rate are 2.06 percent and 2.66 percent respectively.

2/ Minimum real GDP growth in Croatia -0.86; Maximum unemployment rate 22.3. The 2006 baselines for the two variables are taken as 4.5 and 13.3 respectively.

F. Concluding Remarks and Policy Implications

25. **This paper adds a new dimension to analyzing bank stability in Croatia.** Using data on other emerging European countries, it quantifies the effect of an economic downturn on loan-loss reserves, and uses this quantification to calculate the adverse effect of higher loan-loss reserves on the capitalization of the Croatian banking system. While caveats should be mentioned, there are a number of aspects of the analysis that help to give new insights.

26. **On caveats, the data from Bankscope covers the systemically important banks in each country, but does not cover all the banks.** In addition, although panel data is used, the estimation technique, to preclude complications of using lagged dependent variables in systems regressions, does not exploit panel characteristics by taking fixed or random effects. Finally, the analysis does not capture the indirect credit risk stemming from foreign exchange or foreign exchange indexed loans to unhedged borrowers.

27. **That being said, the number of loan-loss episodes related to large exchange rate depreciation events is few in the countries in the sample, given their closely managed exchange rate regimes.** Thus an econometric analysis on foreign exchange induced credit risk would be difficult to make under such limited information. The estimation of the system of equations does benefit from efficiency gains by taking into account feedback effects between loan-loss reserves and bank stability.

28. **Novel features of the analysis include the use of the regression results to quantify the potential deterioration of capitalization under scenarios for an economic downturn.** Furthermore, using data on EU15 banks, the analysis goes further to demonstrate that the potential deterioration of capitalization would be less if Croatian banks behaved more like the EU15 banks.

29. **To close, some key policy-related observations and policy implications are summarized below.**

- *The analysis confirms that more stable banks are susceptible to lower credit risk.* Banks with higher z-indices required less loan-loss reserves, ceteris paribus.

- *Accelerating credit growth increases credit risk, especially if credit growth is already high.* Accelerating credit growth in previous periods along with an economic downturn could have severe consequences on credit quality, and hence on profitability and capitalization. The negative effect of these latter factors is accentuated in banks with a lower stability or z-index.

- *A downturn could have a large and negative effect on capitalization, thus larger buffers would be helpful in Croatia.* These buffers could be built either in the form of higher provisions for unidentified loan-losses or higher risk weights on risky loans. This policy implication is similar in spirit with recommendations made in Kraft and

Jankov (2005) that argue for higher capital requirements for fast growing banks to prevent future asset quality problems from turning into bank failures.[16]

- *Provisions on loans, especially those made under the incorrect assumption that the banks have access to the borrowers' income in case of default, should be increased.* This is because such income would be unavailable if the defaulted borrower becomes unemployed.

- *Croatian banks would also be less vulnerable if they behaved more like EU15 banks.* If they did, counterfactual analysis suggested that the adverse effect of a downturn on capitalization would be less.

- *The possibility that the risk premium embedded in loan interest rates is too low makes it all the more important to evaluate the need for building up provisions or increasing risk weights.* Croatian banks are not necessarily passing on the higher risk of foreign exchange denominated or indexed loans to unhedged clients by charging higher interest rates on these loans. A CNB publication (CNB, 2006, pp 49) also suggests that Croatian banks tend to underestimate credit risk during periods of high economic growth. This behavior could be due to the high competition among the top banks. Loan policies could vary between banks, with some banks perhaps better than others in passing on credit risk to their customers. The recent increase in risk weights on loans to unhedged clients by 25 percentage points is a welcome move. It is also encouraging in this context that the CNB has further enhanced supervision of banks' credit risk management policies by issuing a couple of guidelines on monitoring fx-induced credit risk and household credit risk.[17]

- *The stability of Croatian banks could be further enhanced by improving efficiency.* The econometric estimates show that banks with lower cost/income ratio enjoys higher stability. And the ratio of cost to income in Croatia was above average in the EU context.

---

[16] However, Kraft (2004) had suggested that dynamic provisioning—similar to the model used in Spain—would not be feasible for Croatia mainly due to unavailability of data over at least two business cycles.

[17] These documents can be obtained from http://www.hnb.hr/supervizija/e-smjernice-za-upravljanje-informacijskim-sustavom.pdf?tsfsg=45967eb2b3b4ec8a77b2bfb2e369b12e and http://www.hnb.hr/supervizija/e-smjernice-za-upravljanje-kreditnim-rizikom.pdf?tsfsg=65e6f2fc581156cf65704e28f1e3282b.

REFERENCES

Borio, Claudio, Craig Furfine, and Philip Lowe, 2001, "Procyclicality of the financial system and financial stability: issues and policy options," BIS Papers 1 http://www.bis.org/publ/bispap01a.pdf.

Boyd, John H., Gianni De Nicolo, and Abu Al Jalal, 2006, "Bank Risk Taking and Competition Revisited: New Theory and New Evidence," mimeo, April, forthcoming IMF Working Paper.

Croatian National Bank, 2006, "Macroprudential Analysis," II(3), September. http://www.hnb.hr/publikac/makrobonitetna-analiza/e-mba-03.pdf?tsfsg=3cf2637317b63c68ec1028d90f843a03.

De Nicolo, Gianni, 2000, "Size, Charter Value and Risk in Banking: An International Perspective," International Finance Discussion Papers 689, FED Board, December.

De Nicolo, Gianni, and Alexander Tieman, 2006, "Economic Integration and Financial Stability: A European Perspective," mimeo, September, forthcoming IMF Working Paper.

Laeven, Luc, and Giovanni Majnoni, 2003, "Loan-loss provisioning and economic slowdowns: too much, too late?" *Journal of Financial Intermediation,* Vol. 12, pp. 178–197.

Kraft, Evan, 2004, "Dynamic Provisioning: results of an initial feasibility study for Croatia," Paper prepared for the Banking Supervisors of Central and Eastern Europe Conference, Dubrovnik, Croatia, May 27–28.

Kraft, Evan, and Ljubinko Jankov, 2005, "Does Speed Kill? Lending Booms and their Consequences in Croatia," *Journal of Banking and Finance*, Vol. 29, pp. 105–121.

Maechler, Andrea, Srobona Mitra, and Delisle Worrell, 2006, "Exploring Financial Risks and Vulnerabilities in New and Potential EU Member States," IMF WP, forthcoming. The 2005 DG-ECFIN conference version available at http://ec.europa.eu/economy_finance/events/2005/bxlforum1005/maechler_mitra_en.pdf.

Tamirisa, Natalia, and Martin Cihak, 2006, "Credit, Growth and Financial Stability,"*Selected Issues*, IMF Country Report No. 06/392. http://www.imf.org/external/pubs/ft/scr/2006/cr06392.pdf.

Tamirisa, Natalia, and Deniz Igan, 2006, "Credit Growth and Bank Soundness in the New Member States," IMF Country Report No. 06/414. http://www.imf.org/external/pubs/ft/scr/2006/cr06414.pdf .

Appendix. Credit Risk Calculation

It should be noted that the dependent variable is the logit transformed loan-loss reserves to total loans, and the specification has a lagged dependent variable. Let loan-loss reserves/total loans be Y in percent and the unemployment rate or real GDP growth rate (or any variable in question) be X in percent. Then the (medium-term) change in Y in response to changes in X is given by

$dY = \frac{coef(X)}{1 - coef(laggedY)} * \frac{\overline{Y}(100 - \overline{Y})}{100} dX$, where $\overline{Y}$ is the panel mean of Y. For Emerging Europe, $\overline{Y} = 7$.[18] Therefore, if real GDP growth falls by 1 unit, then loan-loss reserves/loans changes (from Table V.1 column 6) by

$$dY = \frac{-0.025}{1 - 0.75} * \frac{7(100 - 7)}{100} * (-1) = 0.65$$

We assume that this change in Y is entirely due to a change in loan-loss reserves, and that there is no change in total loans (the denominator). Thus, the nominal change in loan-loss reserves of bank *i* is $\frac{0.65}{100}$ * loan of bank *i*.

The resulting change in the capital adequacy ratio (CAR) of bank *i* is:

$$100 * \frac{regulatory\ capital - \Delta loan\ loss\ reserves}{risk\ weighted\ assets - \Delta loan\ loss\ reserves} - Old\ CAR.$$

The calculations (not shown) were based on bank-by-bank data, as of June 2006, published by the CNB on their website.[19] The aggregate (weighted by risk-weighted assets) CAR of the banking system is reported in Tables V.4 and V.5.

---

1. [18] The calculations are sensitive to values of $\overline{Y}$, but not so sensitive as to change the qualitative results. For example, in the extreme case in Table V.4, a $\overline{Y} = 3$ increases the post-shock CAR, but still leaves banks with 83 percent of banking system assets below a CAR of 10 percent.

2. [19] See "Indicators of Banking Institutions Operations" at http://www.hnb.hr/supervizija/esupervizija.htm?tsfsg=7860b148848e3eafbe66832697b67f32.