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# IMF Working Paper

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## Eurosclerosis or Financial Collapse: Why Did Swedish Incomes Fall Behind?

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## IMF Working Paper

IMF Institute

### **Eurosclerosis or Financial Collapse: Why Did Swedish Incomes Fall Behind?**

Prepared by Valerie Cerra and Sweta Chaman Saxena<sup>1</sup>

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#### **Abstract**

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Sweden represents an archetypal welfare state economy, with extensive government safety nets. Some scholars have attributed a decline in its per capita income ranking since 1970 to “eurosclerosis” or sluggish growth caused by distortionary policies. This paper argues rather, that the permanent loss in output following Sweden’s banking crisis in the early 1990s explains the decline in its per capita GDP ratings. The paper finds no macroeconomic evidence that welfare state policies have deterred growth. The results warn that empirical growth analyses should distinguish between trend output growth and permanent output loss associated, for example, with financial crises.

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Contents	Page
I. Introduction .....	3
II. The Swedish Economic Model .....	4
III. Evidence on Growth and Redistribution.....	5
IV. The Debate on Sweden's Ranking of Income Per Capita.....	7
A. Developments and Controversies in Rankings .....	8
B. Long-term Analysis.....	10
V. Econometric Analysis of Output Loss .....	15
A. Theory .....	17
B. Econometric Model.....	18
C. Data and Results.....	19
VI. Conclusions.....	21
References .....	22
Tables	
1. Marginal Excess Burden per Krona of Tax Revenue (in percent).....	6
2. Sweden's Relative GDP per capita.....	8
3. Sweden: Relative Ranking Between 1970 and 1991 .....	9
Figures	
1. Ratio of Working-Age Population to Total Population .....	10
2. GDP per capita, 1995 PPP\$ .....	11
3. Relative GDP per capita, 1960 and 2003.....	11
4. Sweden and OECD: Income Measures, 1960-2003 .....	12
5. Sweden and Comparator Countries: Income Measures, 1960-2003.....	13
6. Growth Rates, GDP per working-age person, 1995 PPP\$.....	13
7. Labor Market Indicators .....	14
8. Sweden's Banking Crisis: Boom and Bust.....	16
9. Probability of Recession in the Permanent Component of Output.....	20
10. Log Output and Change in Fitted Values .....	20

## I. INTRODUCTION

What is the appropriate role for government in economic activity and in providing social safety nets for a country's population? How does government involvement in economic life, through direct activity or through fiscal policies, affect growth and development as well as the distribution of income? Academics have wrestled with these major questions for decades. Different views on the role of government have fostered sweeping political experiments, some of which have ended in dramatic failure. Sweden's economic policy framework arguably represents the archetype of the Scandinavian economic model, which combines a core of private sector production and market-based incentives with extensive redistribution and government interventions, particularly in labor markets. Through its tax and transfer system, as well as labor bargaining framework, the Swedish model attempts to ensure a fairly equal distribution of income and pervasive social safety nets. A notable feature of the model is the high average and marginal tax rates on labor income and savings. Economic theory suggests high taxes would distort labor supply and saving decisions, leading to welfare losses and, potentially, to lower growth.

Indeed, in the mid-1990s, critics of the welfare state argued vociferously that welfare state policies had undermined Sweden's growth performance. The book *Turning Sweden Around* by Lindbeck et al. (1994) reported a decline in Sweden's ranking of income per capita relative to other countries. A special issue of *Economic Journal* in 1996 centered on whether Sweden had suffered a relative decline in economic growth and living standards and, if so, the reasons for such a decline. A part of the debate focused on the empirical question of the accurate measurement of Sweden's economic performance relative to that of other advanced economies and various technical issues germane to this question. A second part revolved around whether the decline could be attributed to the large public sector or to other factors such as demography and specific policy mistakes. In broad terms, this debate has obvious parallels with the debate on the causes of slower growth in Europe, the so-called "eurosclerosis" question.

Do the high tax burden and labor market interventions that are associated with the Swedish model generate slow economic growth, or "eurosclerosis"? This paper returns to the question with the advantage of several additional years of data and offers a new interpretation of the growth performance. In doing so, we provide a cautionary note about inference on determinants of growth, with implications for cross-country growth studies. In particular, we argue that Sweden's ranking in income per capita slipped suddenly at the time of the banking crisis of the early 1990s, rather than being an outcome of redistributive policies.

We employ a combination of analytical arguments and formal econometric testing to show that sharp negative shocks, such as Sweden's banking crisis in the early 1990s, produced a permanent decline in the level of output at the time of the shock. This is evident from examining the times-series behavior of output rather than narrowly focusing on a single measure of average long-run growth. This finding underscores the fragility and misspecification of long-run cross-country growth studies and underscores the advantage of analyses that include the time dimension. In the Swedish case, the sizable output loss

associated with its financial crisis dwarfs any decline associated with tax distortions and public interventions, which remain largely unnoticeable in the macroeconomic data.

Our story and arguments unfold as follows. We briefly summarize some of the central features of the Swedish economic model and outline the academic evidence on the relationship between growth and redistribution. We then turn to the debate over the fall in income rankings, providing our own evidence and trying to unscramble the contrary claims by proponents and critics of the welfare state model. Although the graphical evidence is compelling by itself, we formalize our test of the permanent income loss by using a common factor regime-switching model to distinguish permanent and temporary output loss.

## II. THE SWEDISH ECONOMIC MODEL<sup>2</sup>

In many respects, Sweden can be regarded as the epitome of a modern “social democratic” welfare state economy. The Swedish model is characterized by large, centralized institutions and extensive income transfers and social safety nets intended to secure a relatively equal distribution of income and wealth. This mandate for reducing inequality, alleviating poverty and insuring against social risks receives broad political support, perhaps, in part, because of the relatively higher emphasis on universalism in benefits. Social insurance arrangements provide generous support for a wide range of risks, and the tax-transfer system has been fairly successful in achieving the intended goals of reducing poverty and income inequality. These social arrangements have contributed to quality-of-life indicators—including indicators of public health and education—that are among the highest in the world. The Swedish model is also optimistic on the useful contribution of centralized public sector activities in economic production and management. Sweden has a relatively high share of public enterprises and extensive regulatory and supervisory intervention, as well as a large public sector responsible for provision of social services.

The large size of the welfare state is evident from a comparison of Sweden with other countries in terms of the magnitude of the tax-transfer system in relation to the economy. For instance, general government income transfers were about 18½ percent of GDP in 2000, compared with the OECD average of about 13 percent. According to OECD *Revenue Statistics* for 1998, Sweden’s personal income tax was 18.6 percent of GDP vs. the OECD average of 10.1 percent. Other notably high elements in the tax structure include employer’s social security contributions of 10 percent of GDP compared with the OECD average of 5.8 percent of GDP, and payroll taxes at 3.9 percent of GDP compared with the OECD average of 0.4 percent of GDP. Indeed, the high levels of direct taxation and social security contributions made Sweden’s tax wedge on labor the second highest in the OECD in 1998,

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<sup>2</sup> This section draws from Thakur, Keen, Horváth, and Cerra (2003). Chapter 2 provides more information on the main elements of the Swedish welfare state. Additional details on labor market interventions and components of the tax system are outlined in later chapters of the book.

after Germany, and at 52 percent of GDP, Sweden had the highest ratio of total tax revenues to GDP of any OECD country.<sup>3</sup>

Sweden's tax system is structured to minimize distortions caused by the mobility of tax bases. In order to attract and retain corporate tax bases, Sweden has maintained relatively low statutory rates on corporate income taxes. In 2002, for example, Sweden's corporate income tax rate, at 28 percent, was below that of most other OECD member countries. Estimates of the marginal effective corporate tax rate—which includes the impact of interest deductions and depreciation allowances—are very low, providing only a small discouragement to investment.<sup>4</sup> Thus, the bulk of the tax burden required to support the large welfare state falls on labor income. Nevertheless, with the exception of a few well-publicized cases of emigration, Swedish labor mobility has not yet been significant, and labor participation rates are among the highest in the world.

The Swedish model is also characterized by interventions in labor markets that extend well beyond the tax-transfer system. Centralized labor bargaining forms a pivotal element, aiming for full employment at high participation rates in order to ensure an egalitarian income distribution and a large tax base capable of financing high public expenditures. Sweden also supplements passive unemployment insurance with active labor market programs intended to promote a rapid return to employment and to prevent long-term unemployment that results from demotivation and loss of skills by the jobless.

### III. EVIDENCE ON GROWTH AND REDISTRIBUTION

We define “sclerosis” as ongoing sluggish growth caused by distortions stemming from the policies and government interventions that collectively constitute a welfare state economy. There are a variety of theoretical arguments that link a high tax-transfer system to efficiency losses and low growth. Nevertheless, there are counterarguments and mixed empirical evidence for the relationship between growth and redistribution. This section summarizes the main thrust of the literature.

The high average and marginal tax rates required to support an extensive income transfer system are typically assumed to have a negative impact on efficiency by distorting the leisure-work choice toward more leisure. Calculations by Agell, Englund, and Södersten (1995) show that high marginal taxes can generate substantial welfare losses even if labor supply elasticities are small. Table 1 quantifies the marginal efficiency cost of the Swedish tax system arising at different assumed compensated labor supply elasticities. The approximations of the marginal tax wedge (the difference between marginal productivity and

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<sup>3</sup> However, there are some issues of comparability, as Sweden's revenue figures include the taxation of gross social transfers, and relatively high tax expenditures. The magnitude of social spending, and the high level of taxation required to support it, have also been influenced by the relatively early rise in the average age of the population in Sweden.

<sup>4</sup> See Chapter 6 of Thakur, Keen, Horváth, and Cerra (2003) for further details.

real take-home pay) have been calculated by Du Rietz (1994). The wedges were considerably lower in 1991 than in 1988. The table illustrates that even at low labor supply elasticities, a sufficiently high marginal tax rate produces a large marginal welfare loss for each additional krona of tax revenue. There is a region of the tax wedge at which the efficiency cost starts to increase very rapidly and quickly outstrip the extra tax revenue.

Table 1. Marginal Excess Burden per Krona of Tax Revenue (in percent)

	Compensated labor supply elasticity		
	0.05	0.11	0.25
Marginal tax wedge (percent):			
62 (average blue-collar worker, 1991)	8.2	19.0	54.7
63 (average earned income, 1991)	8.6	20.1	59.0
70.5 (average blue-collar worker, 1988)	12.7	31.6	121.8
71.5 (average white-collar worker, 1991)	13.4	33.9	139.1
73 (average earned income, 1988)	14.6	37.8	175.0
79 (average white-collar worker, 1988)	22.0	65.3	2280.0
85.5 (average senior white-collar worker, 1988)	41.0	192.5	---
Tax rate that maximizes tax revenue	94.5	89.5	79.5

Source: Agell, Englund, and Södersten (1995)

However, studies of the impact of tax rates on labor supply in Sweden suggest that while cuts in income tax rates would increase the labor supply of both primary and secondary earners, the growth effects of a small change in marginal taxes may not be substantial, in part because the most elastic group, secondary earners, accounts for a smaller share of the total workforce.

Tax policy can also deter growth. Progressive taxation may discourage human capital accumulation by taxing returns to increased future wages at a higher rate. High corporate taxes may discourage capital accumulation. Finally, high capital income tax on individuals may distort saving decisions.

Social transfers and other fiscal expenditures can also have an impact on labor supply and growth. Liberal unemployment compensation may discourage job search. Generous sickness and early retirement programs may lower labor supply by reducing the opportunity cost of leisure. However, other kinds of government expenditures may encourage growth. For example, public expenditures on education, health, and infrastructure may enhance growth (Barro, 1989; Doppelhofer, Miller and Sala-i-Martin, 2000; Easterly and Rebelo, 1993) by adding to the human and physical capital stock. Indeed, Sweden has maintained high levels of public expenditure on health, education, and infrastructure, and it has performed well on measures of attainment. Sweden scored the highest in literacy skills in the OECD's International Adult Literacy Survey published in 2000 and tops the list of 94 countries in the State of the World index covering women's and children's health, education and political stability (Thakur, Keen, Horváth and Cerra, 2003). Moreover, Berndt and Hansson (1992) find that infrastructure investment had a significant impact on Swedish productivity.

In a model of endogenous growth, Barro (1990) combines the offsetting effects of fiscal taxes and expenditures. In his model, income taxes diminish capital accumulation and growth, but a publicly provided capital good (such as infrastructure) financed from such

taxation increases economic productivity. The model predicts a hump-shaped relationship between the size of government and growth. At low levels of taxation, the government can increase growth by raising tax and spending rates. The higher provision of public goods enhances the returns to private investment (crowding in). However, as taxation rises to very high levels, growth declines as the distortions to output outweigh the productivity benefits of public infrastructure. Overall, the optimal tax rate is positive.

Although redistribution can have negative effects on growth through the distortionary taxes required to finance it, there are a number of theoretical channels by which redistribution can improve growth. If capital market distortions generate liquidity constraints on investment that prevent resources from going to the most productive uses, redistribution can increase growth by allowing the poor to accumulate capital. The provision of a social safety net to protect against some lifetime risks for which private insurance may not be available can also encourage productive risk-taking by reducing the costs of failure. The social and political stability that arises from a more equal income distribution can enhance incentives to save and invest, thereby increasing growth. Equality can contribute to better health and promote schooling, thereby permitting poor individuals to take advantage of their talents.

A number of empirical studies have found a positive relationship between public transfers or income equality and growth (Sala-i-Martin, 1992; Barro, 1989; Alesina and Rodrik, 1994; Persson and Tabellini, 1991; Van Der Ploeg, 2004). Benabou (1996) compared the Philippines and South Korea, which had similar macroeconomic indicators in the early 1960s. In the subsequent thirty years, the more equal South Korea grew fivefold, while the output level of the Philippines barely doubled. Alesina and Perotti (1996) found evidence that inequality creates social unrest and political instability, which, in turn, depress investment and growth. However, the direction of causality between redistribution and growth is difficult to ascertain. Faster growing countries may be able to afford more generous social assistance schemes. The relationship may also depend on the level of development, with inequality in poor countries contributing to poor health and lack of schooling.

The empirical evidence is mixed for OECD countries. Some studies (Hansson and Henrekson, 1994; Weede, 1986; Weede, 1991; Persson and Tabellini, 1994; and Nördström, 1992) find that various social transfers have a significant negative effect on growth in samples of OECD countries, whereas other studies find a positive effect (Korpi, 1985; Castles and Dowrick, 1990; and McCallum and Blais, 1987). The last study finds a nonmonotonic relationship.

#### **IV. THE DEBATE ON SWEDEN'S RANKING OF INCOME PER CAPITA**

Given the conflicting evidence and theoretical arguments for the relationship between tax-transfer systems and growth, we now turn to the specific case of Sweden's growth record. As discussed above, Sweden has maintained one of the highest levels of taxation and transfers of all countries. Therefore, Swedish tax and spending rates are arguably above the level that would maximize its growth rate. Such concern motivates the debate over sclerosis. This section discusses the various issues of interpretation and alternative explanations of the data on Sweden's per capita income and its ranking among other advanced countries.

### A. Developments and Controversies in Rankings

Sweden progressed from being one of the poorest countries in Europe in the middle of the nineteenth century to being among the richest countries in the world by 1950. Industrialization based on raw materials, an exceptionally high rate of labor productivity growth, and Swedish neutrality in the world wars brought about a century of uninterrupted, strong economic growth.

Table 2. Sweden's Relative GDP per capita 1/

	1870	1913	1950
	79.8	83.9	134.4

Source: Maddison (2001).

1/ At 1990 PPP dollars relative to the 12 largest European economies.

Although Sweden's per capita income declined relative to the average of the 12 European countries over the subsequent twenty years, it still retained its high ranking through 1970. Lindbeck et al. (1994) note that Sweden's ranking among OECD countries fell from number 3 in 1970 to number 14 in 1991.<sup>5</sup> Since this claim has generated considerable debate, the table on which it was based is reproduced below for reference (Table 3).

The debate over the apparently sharp decline in Sweden's ranking occupied a special issue of *Economic Journal* in 1996. Korpi (1996) fervently argues that measurement problems, sample period selection, and other factors give an appearance of relative decline, whereas in fact Sweden's income has been fairly stable in relative terms. Even if the ranking had declined, factors such as demography, catching up, and avoidable macroeconomic mistakes may have caused the relative decline, rather than Sweden's welfare state policies.

Several technical issues have a significant impact on output or growth comparisons and play a role in the disagreements over the case of Sweden. The use of current exchange rates or selection of an arbitrary year for measurement could produce misleading and volatile GDP comparisons. Periods of deteriorating terms of trade and of rampant inflation can contribute to an erosion of the exchange rate and a diminishing relative income position. Developments of the U.S. dollar-ECU or dollar-euro cross rates also affected the position of the Swedish krona at times, such as in the mid-1980s. For instance, Korpi (1996) used 1985 exchange rates to present Sweden's relative income over time. In 1985, the U.S. dollar was strong relative to the EMS currencies, and the Swedish krona was tied to a basket with a disproportionate weight on the U.S. dollar. The use of a strong krona presented the level of Sweden's income favorably. Purchasing power parity (PPP) adjusted exchange rates are widely used in cross-country growth comparisons to help avoid this problem.

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<sup>5</sup> The ranking depends on the exchange rate and other issues, and could vary among sources.

Table 3. Sweden: Relative Ranking Between 1970 and 1991

1970 Rank		Index	1991 Rank		Index
1	Switzerland	145	1	United States	125
2	United States	141	2	Switzerland	122
3	Luxembourg	108	3	Luxembourg	120
<b>3</b>	<b>Sweden</b>	<b>108</b>	4	Germany	110
5	Germany	105	5	Canada	108
6	Canada	102	5	Japan	108
7	Netherlands	101	7	France	103
8	Denmark	100	8	Denmark	99
8	France	100	9	Belgium	98
10	Australia	99	10	Austria	97
11	New Zealand	98	10	Iceland	97
12	United Kingdom	93	12	Italy	95
13	Belgium	90	12	Norway	95
14	Austria	86	<b>14</b>	<b>Sweden</b>	<b>94</b>
15	Italy	85	15	Netherlands	93
16	Finland	82	16	Australia	91
17	Japan	80	17	Finland	90
18	Norway	33	18	United Kingdom	88
19	Iceland	75	19	New Zealand	78
20	Spain	64	20	Spain	72
21	Ireland	50	21	Ireland	65
22	Portugal	42	22	Portugal	52
23	Greece	41	23	Greece	44
24	Turkey	17	24	Turkey	20

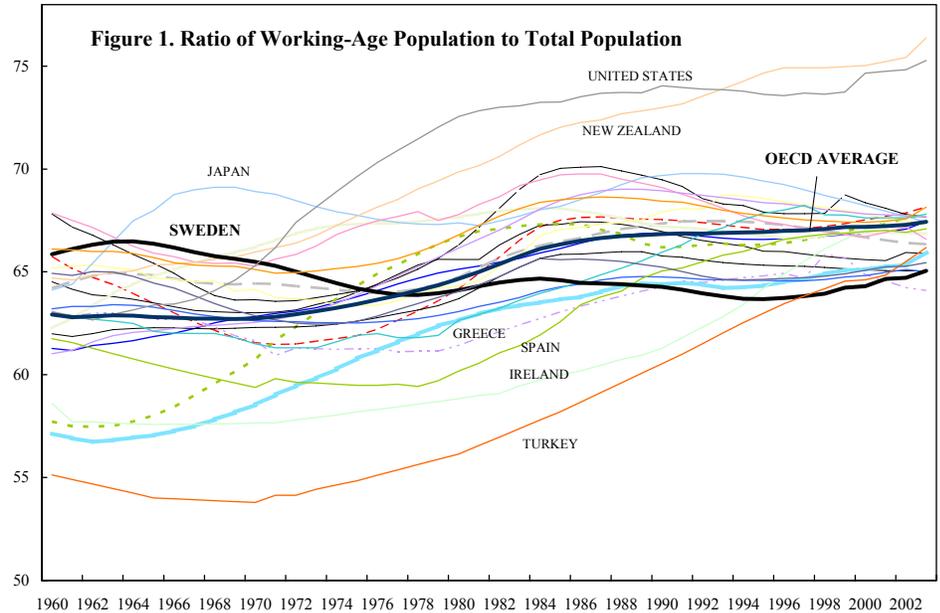
Sources: OECD National Accounts; Lindbeck et al. (1994).

The choice of sample periods can have a decisive influence on the change in relative rankings. The output levels of a large group of fairly rich OECD countries are so close to each other that different states of the business cycle can produce volatile rankings among the countries. The comparison of ranking in Lindbeck et al. (1994) relies on the end points of 1970 and 1991. According to Korpi, Sweden's high ranking in 1970 is based on a peak in economic activity, as growth was 5.6 percent in this year. Sweden does not drop to fourteenth place until 1991, which was the beginning of a major recession. Korpi's presentation of 1973 and 1989 shows Sweden's position in a more favorable light because, in 1973, Sweden suffered a relatively deep recession, while in 1989 it was in the midst of an unsustainable boom. Thus, the choice of the sample's end points can change the conclusion about Sweden's relative decline substantially.

Sweden's initial high income position would suggest that a part of the decline in its relative ranking reflects a convergence phenomenon. Countries with lower initial per capita incomes will tend to have higher growth rates as they "catch up" with the richer countries, through, among other factors, the importation of technology. Although this factor need not imply a change in countries' per capita output rankings, it should force the levels to

converge. Convergence would make it easier for small differences in other factors to significantly affect country rankings. Convergence implies that even if countries' rankings remain the same, there should be a decline over time in the relative income levels of the initially rich countries. Dowrick and Nguyen (1989) estimated that Sweden's smaller scope for catching up reduced growth by 0.8 percentage points during the period 1950–73 compared with the OECD average. Decomposing growth, they found that the rate of differential total factor productivity (TFP) growth was 0.79 percent per year in 1950–60, and -0.25 percent per year in 1973–85.

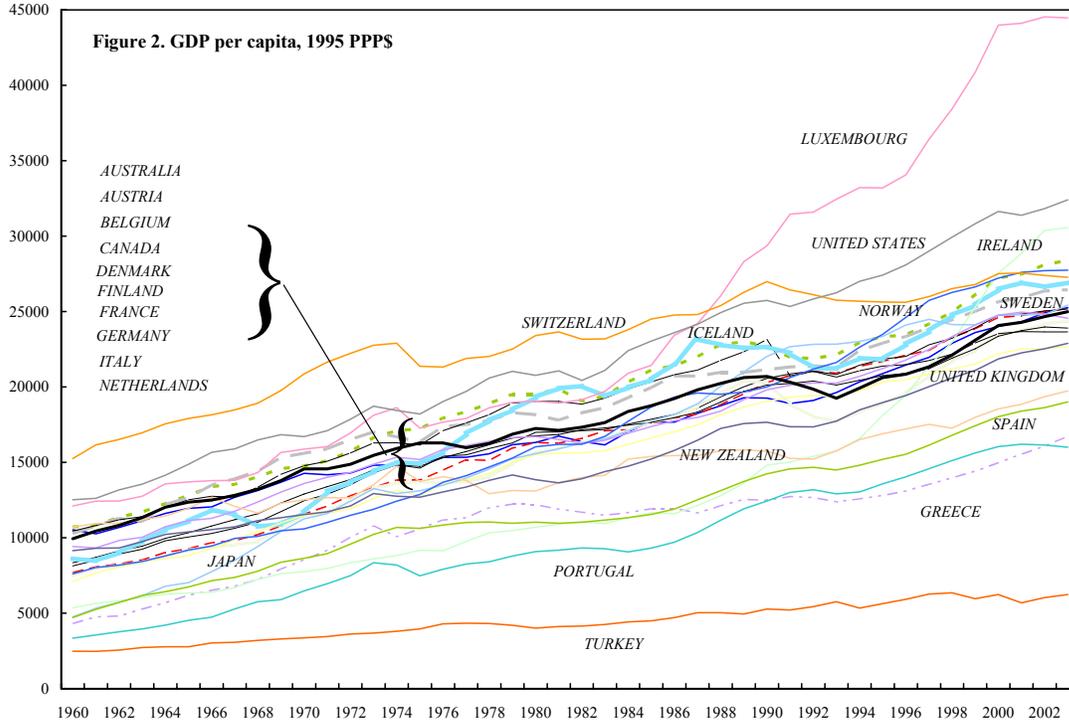
The timing of the demographic transition can be an important consideration in the analysis of per capita income. One of the reasons underlying Sweden's relative decline in the OECD's ranking by per capita GDP may be that the demographic shock of an aging population hit Sweden well before other countries. This was the consequence of the earlier rapid expansion, which was boosted by the relatively young population after World War II, which, unlike in other European countries, was not decimated by the war. Figure 1 shows that the ratio of working-age persons to the total population in Sweden declined slightly over the four decades, while it rose, on average, in 24 OECD countries.



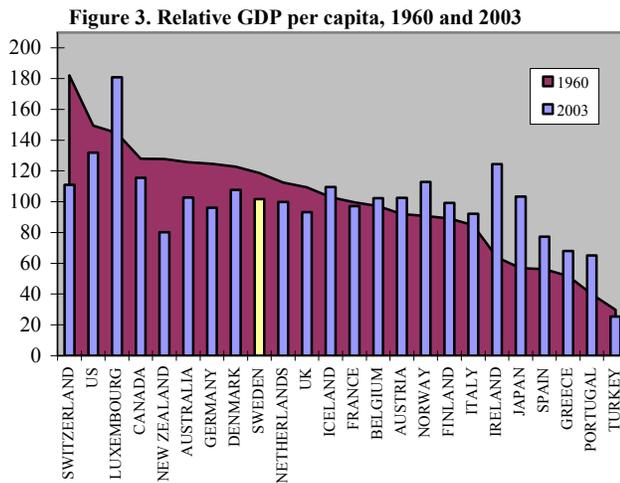
## B. Long-term Analysis

Over a long span of years, Sweden seems to have slipped in the table of rankings of living standards as measured by per capita income. This section analyzes the developments in Sweden's relative income position, taking into account several of the arguments discussed above. To avoid problems of sample period selection, we examine the entire path of relative per capita output. The effects of convergence can be viewed by comparing the paths of other initially rich countries with that of Sweden. Figure 2 shows the path of per capita GDP in Sweden and 23 other OECD countries over the period 1960-2002 based on 1995 prices and purchasing power parity (PPP) exchange rates. From the mid-1970s through 1990, most countries experienced a slight slowdown in growth, but growth in several countries took off again in the 1990s. Between 1960 and the mid-1970s, Sweden was in the top half of the countries in the sample, but its per capita income was fairly close to that of many countries. Indeed, the figure shows the striking proximity of a number of countries' income levels and illustrates the ease of switching ranking over time, even due to business cycle influences.

Sweden's per capita income appears to have grown broadly in line with the bulk of countries concentrated in the center of the sample until 1990. In the early 1990s, Sweden's banking crisis and recession appear to have led to a permanently lower level of output, allowing a number of the countries to overtake Sweden in the GDP per capita rankings.



The slippage in Sweden's relative income reflects the convergence phenomenon. Figure 3 compares each country's relative GDP per capita in 1960 and 2003, and shows that, with the exception of Luxembourg and Turkey, there has been a pattern of convergence in relative incomes. Countries with per capita income above (below) the average in 1960 have experienced a relative decline (increase) in the period up to 2003. Sweden's per capita income was above the mean in 1960 and had fallen near to the mean by 2003.

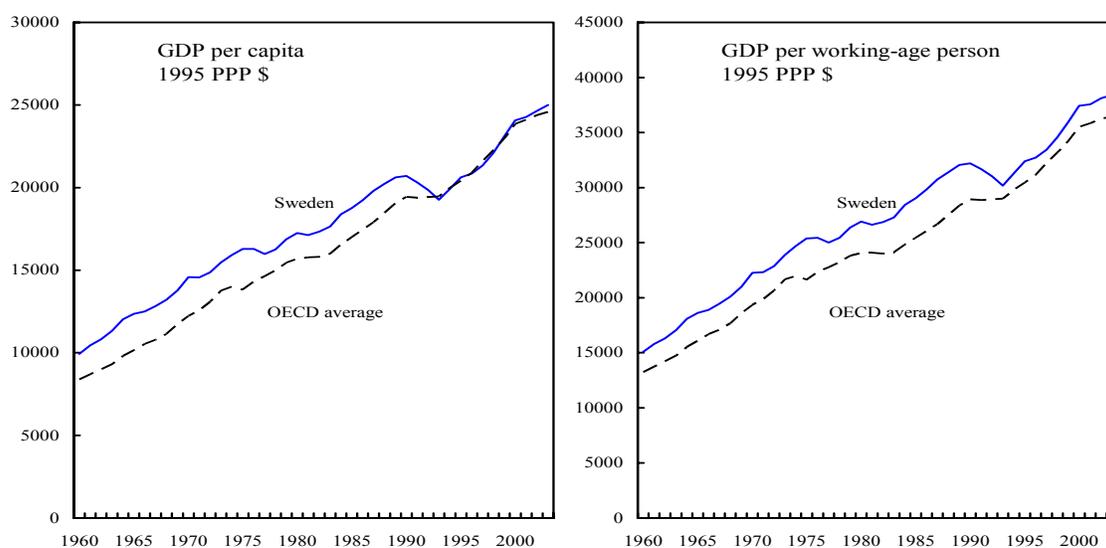


Source: OECD; and IMF, International Financial Statistics.

The deterioration in Sweden's relative position is corroborated by measures of output per person of working age. Alternative measures to output per capita that take account of the differences in demographic structure across countries are output per employed person and

output per working-age persons. Since employment rates vary with the business cycle and long-term unemployment rates differ across countries, output per employed person could be high because of either a high level of output or an exceptionally high unemployment rate. To avoid these problems, we focus on output per working-age person as the alternative income measure that adjusts for the demographic structure. Figure 4 compares the measures of income for Sweden and the OECD average for the period 1960-2003. The left panel divides the country's income into its total population, whereas the right panel divides it into the working-age population. Both measures show that Sweden maintained its relative position above the average until its severe recession in the early 1990s. From the early 1990s, Sweden's relative GDP per capita fell to the average of the 24 countries, whereas its relative GDP per working-age person fell, but remained above the average.

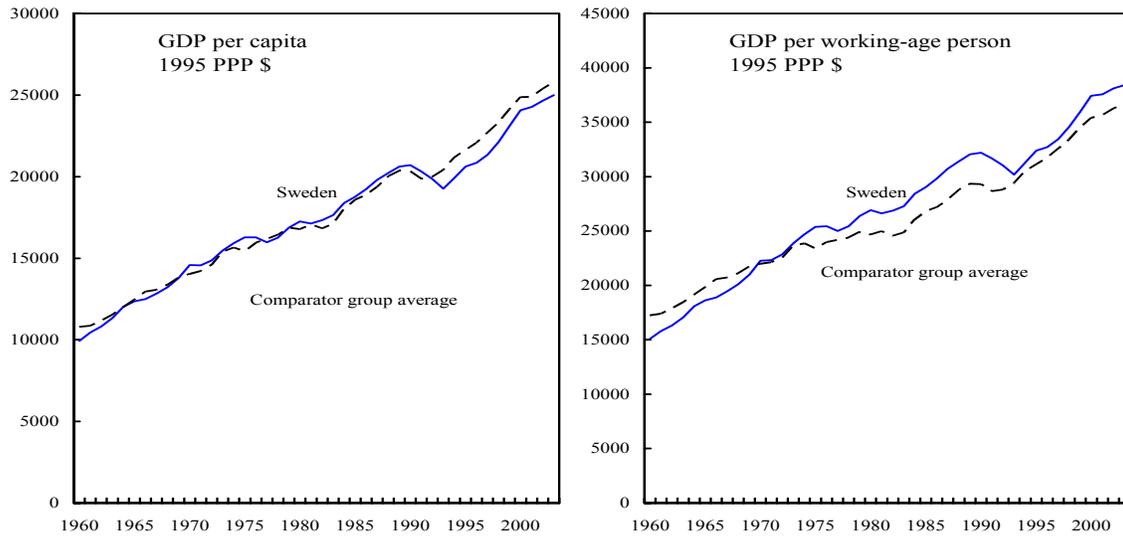
**Figure 4. Sweden and OECD: Income Measures, 1960-2003**



Source: OECD; IMF, International Financial Statistics; and authors' calculations.

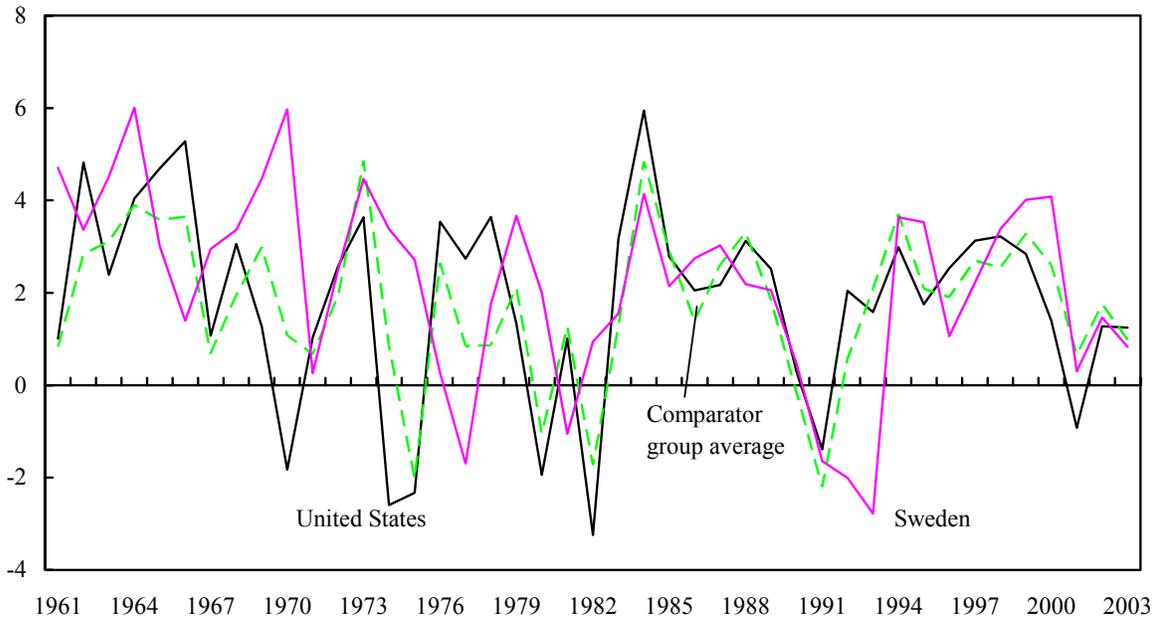
Since the OECD average includes a number of other countries in Scandinavia and continental Europe that also maintain large welfare states, we compare the pattern of income growth with that of the following OECD countries: Australia, Canada, New Zealand, the United Kingdom, and the United States. This comparator group has a relatively smaller tax-transfer system (see, for example, OECD, *Taxing Wages 2002/2003*). Figure 5 illustrates that Swedish growth per capita has been in line with the average for the comparator group, falling during the banking crisis, as shown earlier. However, Swedish growth rates of output per working-age person compare well with those of the United States and with the average for the comparator group. Even accounting for the decline in the early 1990s, Swedish growth outpaced the average for the comparator group over the sample, moving income per worker from below the average in 1960 to above it in 2003. Growth rates strongly parallel developments in the United States and the average for the comparator group, except that the timing is asynchronous in the early part of the sample.

**Figure 5. Sweden and Comparator Countries: Income Measures, 1960-2003**



Source: OECD; IMF, International Financial Statistics; and authors' calculations.  
Note: Comparator group consists of Australia, Canada, New Zealand, United Kingdom, and United States.

**Figure 6. Growth Rates, GDP per working-age person, 1995 PPP \$**

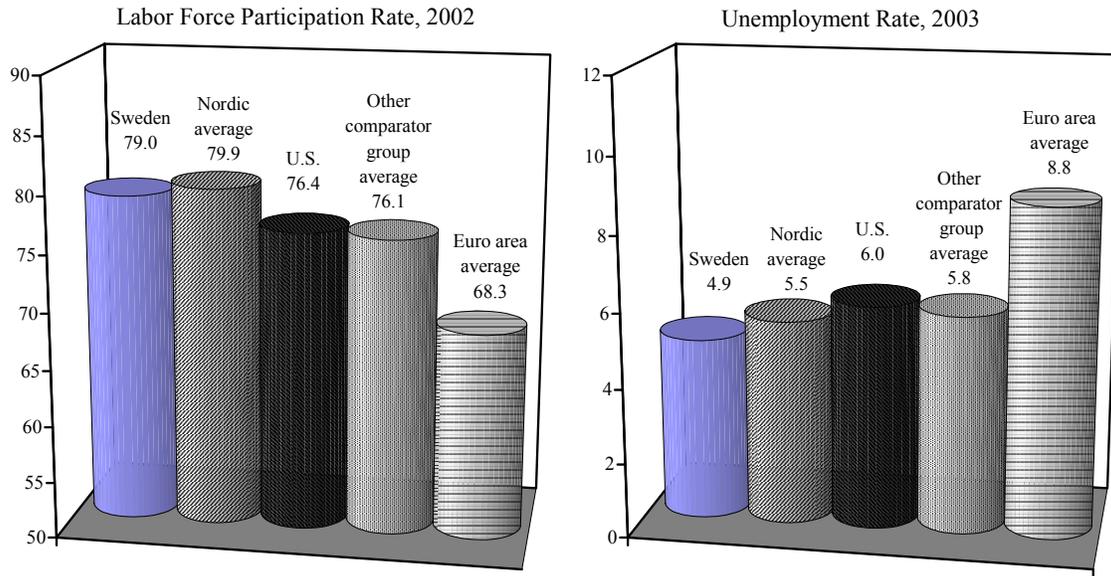


Source: OECD; IMF, International Financial Statistics; and authors' calculations.  
Note: Comparator group consists of Australia, Canada, New Zealand, United Kingdom, and United States.

Swedish labor market indicators also compare well with those of other countries. In 2002, the labor force participation rate in Sweden, although slightly below the Nordic average, was higher than that of the United States and surpassed the averages for the comparator group and the euro area. Unemployment was lower in Sweden in 2003 than in the

United States and in the comparator groups. Indeed, Swedish unemployment rates were considerably below those in the United States until the banking crisis led to a sharp surge in unemployment, which has been only partly reversed in recent years.<sup>6</sup>

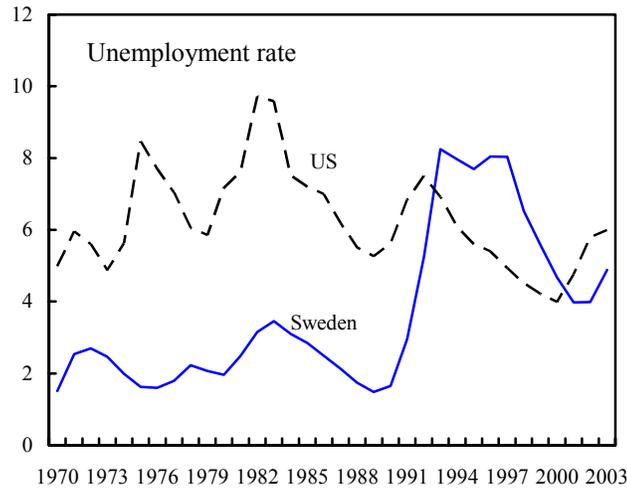
Figure 7. Labor Market Indicators



Source: OECD Analytical Database, and OECD Employment Outlook.

Note: Labor market indicators are measured relative to population aged 15-64.

Other comparator group comprises Australia, Canada, New Zealand, United Kingdom, and United States.



<sup>6</sup> However, active labor market programs averaged 2½ percent of the labor force over the last five years, raising total unemployment in Sweden slightly above the U.S. rate.

The analysis above demonstrates that Sweden's relative GDP per capita declined over 1960–2003, but the relative deterioration occurred suddenly with the onset of the financial crisis in the early 1990s. If sclerosis were responsible for the slippage in rankings, we would expect to find a gradual deterioration of the relative position, consistent with persistent labor market distortions and other efficiency losses associated with high taxation and interventions. Instead, the relative slippage appears to be an outcome of macroeconomic policy errors leading to the financial crisis.

Policy mistakes following Sweden's post-liberalization boom contributed to the banking crisis and sharp recession in the early 1990s.<sup>7</sup> In the latter half of the 1980s, Sweden maintained a fixed exchange rate regime while having high inflation and rapid credit expansion. High inflation and tax policy interacted to produce negative real interest rates and a surge in private consumption and investment during the second half of the 1980s (see Figure 8). In 1990-91, Sweden reformed its tax system without suitable expenditure side adjustment. Additionally, attempts to maintain the fixed exchange rate despite a slowdown of external demand led to rapid disinflation. Real interest rates and the fiscal deficit skyrocketed, and asset markets collapsed. Personal saving rates soared for precautionary motives, spurred by the end of the asset price bubble and by concerns over proposals to cut back the welfare state. The unemployment rate rose to unprecedented levels and nonperforming loans in the banking system swelled. The costs of recapitalizing the banking sector were substantial, adding to public debt and concerns over debt sustainability.

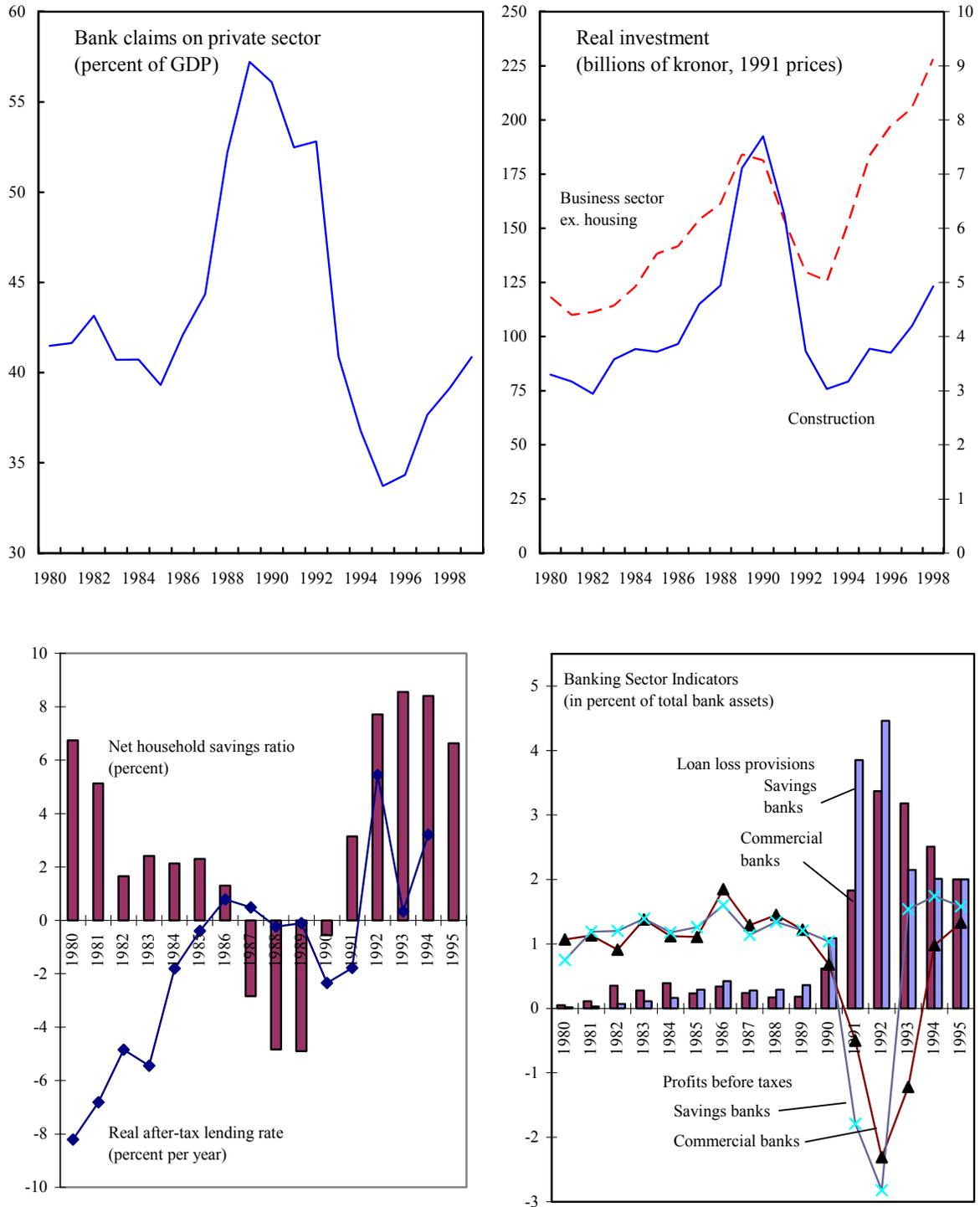
## V. ECONOMETRIC ANALYSIS OF OUTPUT LOSS

The sections above described the debate over Sweden's growth performance. We argued that the relative slippage in ranking could be attributed to the output loss associated with the banking crisis rather than as a result of gradual but persistent "eurosclerosis." In this section, we formalize the proposition that the banking crisis produced a permanent loss in output. We first describe different models of business cycles prevalent in the academic literature. We then use an econometric model to capture the essential properties of the leading theories of business cycle dynamics and to extract the temporary and permanent components of output. We allow both the temporary and the permanent components of output to undergo regime switching. The model estimates the conditional probabilities of the unobserved states, which include the probability that there was a decline in the permanent component of output at the time of the crisis.

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<sup>7</sup> For a detailed discussion of the Swedish crisis in the context of the Nordic banking crisis, see Drees and Pazarbaşıoğlu (1998).

Figure 8. Sweden's Banking Crisis: Boom and Bust



Source: IMF, OECD, and national authorities.

## A. Theory

The nature of output fluctuations continues to attract considerable academic debate and investigation, particularly among scholars of the business cycle. In a landmark study, Nelson and Plosser (1982) proposed that output is difference- rather than trend-stationary. Hamilton (1989) extended this concept of the business cycle with his pioneering work on regime switching. In his seminal paper, the stochastic trend in output undergoes regime switching between positive and negative growth states. Since the regime switch occurs in the growth rate of the permanent component, a negative state results in output loss that is permanent. The welfare consequence of the Hamilton model contrasts sharply with those of a model in which the regime switching occurs in a common temporary component of output. This second model has its roots in the work of Friedman (1964, 1993), in which recessions can be characterized as a temporary “pluck” down of output. After this large negative transitory shock dissipates, output returns to trend in a high-growth recovery phase. Since the Friedman recession represents a temporary deviation from trend, followed by a full recovery to the original trend line, the output loss is temporary.

Our model is agnostic regarding the duration of output loss. Most of the literature that investigates the business cycle considers regime switching in only one of the components of output. As in Kim and Murray (2002) and Kim and Piger (2002), we allow both the permanent and temporary components of output to undergo regime switching. Kim and Piger, however, use only one state variable to control both components. Consequently, their model compels each recession to contain both temporary and permanent explanations. As in Kim and Murray, we use a model that has two independent state variables for the temporary and permanent factors. Such specification is considered superior to a single state variable model with two or three states, as it allows identification of whether the recession associated with Sweden’s banking crisis involved regime switching in the temporary or permanent components of output. Thus, the main interest of this section is to study whether the asymmetry between expansions and crisis-driven recessions are more consistent with the Hamilton or Friedman model of output loss. Both models involve “V-shape” growth recoveries, except that the Friedman model suggests that growth would be temporarily higher during the recovery than during a normal expansion. The econometric model used in this paper explores whether output springs back up to its original path following a crisis-driven recession, or whether growth simply recovers to its trend rate, implying that the level of output has been permanently reduced compared to the original path.

To improve the identification of the permanent and temporary components of output, our model allows for comovement across economic times series, rather than employing univariate analysis. The crisis-induced recession in Sweden involved a simultaneous decline in several economic variables, which motivates the use of a dynamic linear factor model, as innovated by Stock and Watson (1989, 1991, 1993). Kim and Murray (2002) use a series of variables intended to capture comovement with industrial production and focus on constructing a coincident indicator. As in Kim and Piger (2002), we use output, investment, and consumption, which theory predicts should share a common stochastic trend. To check the robustness of the results, we use output, unemployment, and inflation, which should also exhibit synchronous movements over the business cycle.

## B. Econometric Model

This section presents the specification of the dynamic two-factor model used for the empirical analysis. The logs of each of the three series of interest can be decomposed into a deterministic component,  $DT_i$ , a permanent component,  $P_{it}$ , and a transitory component,  $T_{it}$ .

$$\begin{aligned}\bar{Y}_{it} &= DT_i + P_{it} + T_{it} \\ DT_i &= a_i + D_i t \\ P_{it} &= \gamma_i n_t + \zeta_{it} \\ T_{it} &= \lambda_i x_t + \omega_{it}\end{aligned}$$

where  $\bar{Y} = [\text{output, investment, consumption}]$ ,  $n$  is the common permanent component,  $x$  is the common temporary component, and  $\zeta$  and  $\omega$  are the independent idiosyncratic permanent and temporary components, respectively. The model can be written in differenced deviations from means as follows:

$$\Delta y_{it} = \gamma_i \Delta n_t + \lambda_i \Delta x_t + z_{it}$$

where  $z_{it} = \Delta \zeta_{it} + \Delta \omega_{it}$  is a stationary composite of the idiosyncratic components and  $\gamma_i$  and  $\lambda_i$  are the factor loadings on the common permanent and common transitory components, respectively.

The growth rate of the common permanent component is stationary and is approximated by a second order autoregressive process. Note that a stationary *growth* rate implies that the *level* is nonstationary, in accordance with the definition of a stochastic trend. In addition, there is a trend,  $\beta$ , that depends on the permanent state,  $S_{1t}$ :

$$\Delta n_t = \beta_{S_{1t}} + \phi_1 \Delta n_{t-1} + \phi_2 \Delta n_{t-2} + v_t, \quad v_t \sim i.i.d. N(0,1)$$

The state-dependent trend introduces asymmetry along the lines of Hamilton (1989).

$$\beta_{S_{1t}} = \beta_0 + \beta_1 S_{1t}; \quad S_{1t} = \{0,1\}$$

During an expansion phase ( $S_{1t}=0$ ) the stochastic trend grows with the drift rate  $\beta_0$ . If  $\beta_1$  is negative, the trend shifts to a lower growth state when  $S_{1t}=1$ , and shifts to a recession phase if  $\beta_0 + \beta_1 < 0$ .

The common temporary component is stationary in its levels and is approximated by a second order autoregressive process. To incorporate Friedman's type of asymmetry, we allow the temporary component to undergo regime switching in response to a second state variable,  $S_{2t}$ .

$$x_t = \tau S_{2t} + \phi_{11} x_{t-1} + \phi_{12} x_{t-2} + u_t, \quad u_t \sim i.i.d. N(0,1)$$

In state  $S_{2t}=0$ , the intercept is zero. If  $\tau_i < 0$ , then the economic series is “plucked” down when  $S_{2t}=1$ . When the state returns to normal,  $S_{2t}=0$ , the economy reverts back to trend level.

Finally, each series has its own stationary idiosyncratic component, again approximated by an AR(2).<sup>8</sup>

$$z_{it} = \psi_{i1}z_{it-1} + \psi_{i2}z_{it-2} + e_{it}, \quad e_{it} \sim i.i.d. N(0,1)$$

$$E(v_r u_s e_{it}) = 0, \quad \forall i, r, s, t$$

Both state variables are assumed to be independent first-order Markov switching processes with transition probabilities given by:

$$\begin{aligned} \Pr[S_{1t} = 0 | S_{1t-1} = 0] &= q_1, \quad \Pr[S_{1t} = 1 | S_{1t-1} = 1] = p_1 \quad \text{and} \\ \Pr[S_{2t} = 0 | S_{2t-1} = 0] &= q_2, \quad \Pr[S_{2t} = 1 | S_{2t-1} = 1] = p_2 \end{aligned}$$

### C. Data and Results

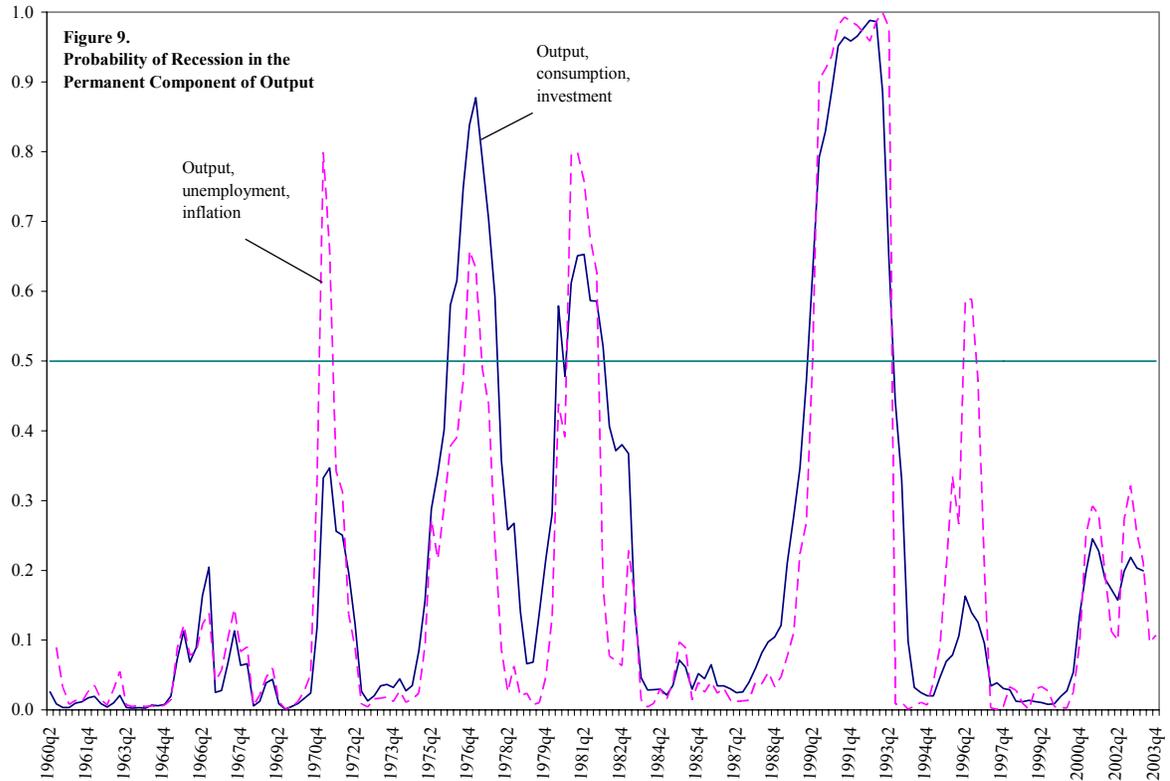
Two datasets are used to identify the permanent and temporary output losses described above. Quarterly OECD data on output, private consumption, and private investment are used as the first dataset to extract the two components of GDP. The other dataset, also from OECD, consists of output, unemployment, and inflation. These are sets of variables that are expected to move together over the business cycle.

The formal analysis supports the contention of a permanent decline in the level of output during Sweden’s banking crisis. The two datasets produce very similar identification of switching in the permanent output component. The results are shown in Figure 9. The probability of a switch to a recession regime in the permanent component of output essentially rises to one for several quarters from 1989 to early 1993. The timing and magnitude are nearly identical regardless of whether the permanent component is identified using output, consumption, and investment or output, unemployment, and inflation. The other episodes of recession in the permanent component of output that are identified by both datasets (with probabilities of recession exceeding 0.5) occurred in 1976-77 and 1980-82, associated with an oil shock and the worldwide recession related to the U.S. disinflation. The probability of a recession regime also surpasses a value of 0.5 for the dataset including output, unemployment, and inflation in 1971 (the first oil shock) and tenuously in 1996. The oil price shocks of the 1970s hit Sweden relatively hard given its energy-intensive production structure that included forestry and pulp, and automobile manufacture. Forestry, accounting

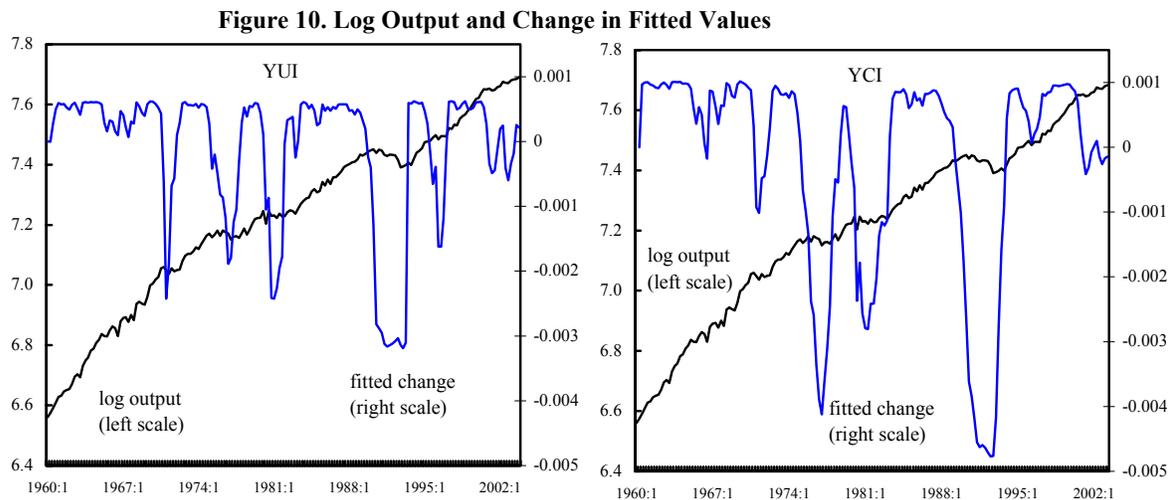
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<sup>8</sup> The assumption of unitary variance is made for identification, but the assumption is not particularly restrictive, as the variances of the permanent and temporary components of output, investment, and consumption depend on the magnitude of the factor loadings.

for 40 percent of Swedish exports in the early 1970s, was particularly impaired by severe terms of trade shocks.



The model appears to match well with the actual data, as shown in Figure 10 below. Actual log output (left scale) is compared to the change in the fitted value of the permanent component of output, using the smoothed probability of a switch to negative regime (right scale). Each episode of negative switch is strongly associated with stagnant or deteriorating output in Sweden.



## VI. CONCLUSIONS

This paper finds that there was a permanent output decline associated with Sweden's banking crisis. The decline led to a drop in Sweden's per capita GDP relative to other OECD countries, and thus a sudden drop in Sweden's ranking. Other than this permanent output loss and a few shallow recessions associated with oil shocks and worldwide recessions, Sweden's growth rate matched the OECD average and exceeded a number of countries with relatively lower tax-transfer systems.

These findings have important academic and policy implications. First, the result provides further documentation of the costs of banking crises and the importance of preventing them with appropriate financial sector supervision and regulation, as well as macroeconomic policies. These results are corroborated in Cerra and Saxena (2004 and 2005), which indicate that permanent output loss is a consequence of most financial crises. Thus, the failure of output to recover to its pre-crisis trend line is not unique to Sweden and thus cannot be attributed to features of the welfare state model.

Second, according to the analysis presented in the paper, there is no evidence that welfare state policies have led to sclerosis, as Sweden has performed at least as well as the average OECD or low tax-transfer comparator group country on a number of macroeconomic criteria. With low unemployment and high labor participation rates, Sweden's labor market performance is enviable. Sweden made a number of macroeconomic mistakes that contributed to its financial crisis, but its growth rate has been in line with that of other countries except for the permanent loss associated with the crisis. Absent the crisis recession, Sweden's income per capita might still rank near the top of all countries.

Third, the analysis suggests caution in inference on growth. Lindbeck et al. (1994) assumed Sweden's slippage in the per capita income rankings among OECD countries was due to sclerosis. But observing the time dimension of growth gives us greater insight: that is, Sweden's relative growth rate and per capita income ranking declined precisely at the time of the banking crisis, rather than throughout the sample. We can extend the lesson from this finding to cross-sectional growth regressions. Many variables have been proposed to explain growth, but collinearity among the variables makes it difficult to identify the causes of growth. Incorporating the time dimension can help identify growth determinants among the many possible variables. For example, Sweden contributes one average growth rate observation in a cross-sectional growth regression. On the right-hand side, it contributes high average tax rates, but also a dummy for having had a banking crisis. In the cross-sectional analysis, the contribution of each left-hand side variable would be difficult to disentangle, whereas the time dimension makes it easier to identify the source of the growth decline.

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