

MONETARY POLICY & THE ECONOMY

Quarterly Review of Economic Policy

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Contents

Analyses

Recovery of the Global Economy in the Second Half of 2009 <i>Anna Orthofer, Josef Schreiner, Klaus Vondra</i>	6
Shocks, the Crisis and Uncertainty about Future Inflation: Theory and Evidence for the Euro Area <i>Ernest Gnan, Johannes Langthaler, Maria Teresa Valderrama</i>	26
The Relationship between Competition and Inflation <i>Jürgen Janger, Philipp Schmidt-Dengler</i>	53
Determinants of Price Comparison and Supplier Switching Rates in Selected Sectors <i>Jürgen Janger</i>	66
Bank Recapitalization and Restructuring: An Economic Analysis of Various Options <i>Helmut Elsinger, Martin Summer</i>	87
The Crisis in Financial Innovation <i>Barry Eichengreen</i>	98

Notes

Abbreviations	106
Legend	107
List of Studies Published in Monetary Policy & the Economy	108
Periodical Publications of the Oesterreichische Nationalbank	111
Addresses of the Oesterreichische Nationalbank	113

Opinions expressed by the authors of studies do not necessarily reflect the official viewpoint of the Oesterreichische Nationalbank or of the Eurosystem.

Analyses

Recovery of the Global Economy in the Second Half of 2009

Anna Orthofer,
Josef Schreiner,
Klaus Vondra¹

The world economy has overcome the cyclical trough. On the back of extensive economic stimulus programs, most economies returned to positive growth rates in the second half of 2009, with emerging countries taking the lead. The rate of the recovery, however, diverges strongly across the different regions.

Not only the emerging Asian countries grew at a vigorous pace; the U.S. economy, too, posted healthy quarter-on-quarter growth at a rate last seen six years ago. Yet, recent confidence indicators suggest that economic growth will continue at a slower pace.

While the world economic recovery gained momentum in the fourth quarter of 2009, the development of economic activity in the euro area remained below expectations. In comparison with the previous quarter, the economy of the single currency area grew by 0.1% in the fourth quarter of 2009, with growth driven exclusively by the positive contribution of net exports. Euro area domestic demand is unlikely to give growth a genuine boost in the quarters to come. Current forecasts generally point to a gradual recovery of economic activity in the euro area, which will, however, be weaker than the U.S. revival.

Euro area HICP inflation returned to positive levels in November 2009. This was due primarily to base effects stemming from commodity prices. The disinflation process of core items, however, is continuing. Given the sluggish recovery in economic activity, the annual core inflation rate fell to a record low of 0.8% in February 2010. The latest forecasts predict that there will be no risks to price stability until the end of 2011.

Especially thanks to a slight recovery in international demand, the Central, Eastern and Southeastern (CESEE) EU Member States entered a period of economic stabilization in the second half of 2009, recording – once again – moderately positive average growth rates (on a quarterly basis). However, cyclical developments still vary significantly across the countries of the region. The economic downturn caused current account balances to improve throughout the entire region and brought down inflation rates in several countries.

After undergoing the deepest and longest recession in post-war history, Austria registered moderate economic growth in the second half of 2009, supported by the revival of international economic activity, the Austrian government stimulus packages and the inventory cycle. According to recent results of the short-term economic indicator of the Oesterreichische Nationalbank (OeNB), growth is set to remain stable. Real GDP is expected to grow by 0.5% in both the first and the second quarters of 2010 (seasonally and working day adjusted, quarter on quarter). For the entire year 2010 the OeNB expects a real GDP growth rate of about 1½%.

JEL classification: E2, E3, O1

Keywords: global outlook, euro area, central and (south-)eastern Europe, Austria

1 Pace of Global Recovery Decelerates

1.1 U.S.A.: Upswing with Uncertain Outlook

The U.S. economy has emerged from the recession. In the fourth quarter of 2009, real GDP grew at an annualized rate of 5.9% (quarter on quarter), the strongest performance in more than six years. All expenditure components contributed to this robust growth. For

the first time, however, the most important factor – alongside the changes in inventories – was gross fixed capital formation.

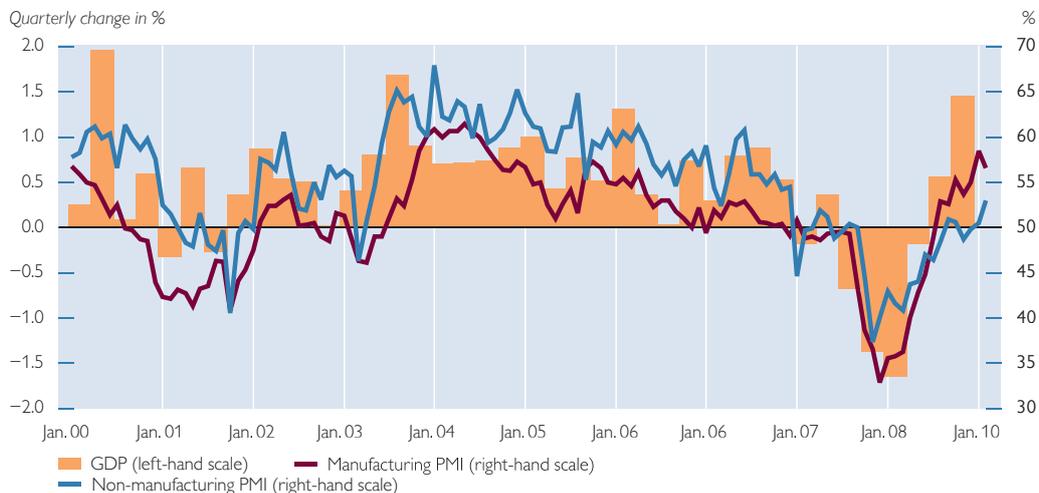
Numerous *leading indicators* corroborate the signs of the economic recovery. Since spring 2009, purchasing managers' business sentiment has brightened continuously. Industrial production, too, has seen continued improvements for more than half a

Cutoff date for data:
March 19, 2010

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Chart 1

U.S.A.: Purchasing Managers' Index and GDP Growth



Source: Institute for Supply Management (ISM), Bureau of Economic Analysis (BEA).

year, with capacity utilization running at a one-year high in February 2010. However, recent data suggest that the economic expansion might soon lose momentum. The February U.S. purchasing managers' index value, for instance, suffered a clear setback. While the confidence indicator has remained above the 50% mark, which points to a continued expansion, it has probably peaked for the time being. Moreover, consumer sentiment has remained fragile. The *Conference Board* research institute, for instance, recorded a steep decline in the Consumer Confidence Index in February after several previous increases.

So far, private consumption has been supported by fiscal policy measures such as tax allowances and car scrapping premiums. *Labor market* developments, however, will be of special relevance for the progress of the economic recovery in the U.S.A. After topping out at over 10% in the fall of 2009, the unemployment rate has stabilized at 9.7% since the beginning of 2010, and the number of initial claims for unemployment benefits has fallen recently. The renewed surge in *produc-*

tivity during the fourth quarter of 2009 also sends out positive signals. These productivity gains can no longer be traced to layoffs, as the number of hours worked has recently been on the rise again. Overall, the tide may have turned on the labor market. However, unemployment cannot be expected to decline sharply yet in 2010, with joblessness remaining at unusually high levels by U.S. standards.

The U.S. Federal Reserve (Fed) recently announced that – although the economy was experiencing a moderate recovery phase – production, sales, income and employment still remained far below their respective precrisis levels. So far, 8.4 million jobs have been lost since the onset of the crisis, and unemployment is likely to stay high for several years to come. While recent labor market developments foreshadow an economic upswing, risks of a jobless recovery prevail. The Fed expects a GDP growth rate of around 3½% for 2010 and around 4½% for 2011. At 2½% to 3%, the 2010 forecasts of international institutions and the private sector are less optimistic.

The stabilization of the real estate market is an important precondition for a sustainable recovery of the financial system and the overall U.S. economy. The *residential property* market seems to have stabilized for the time being, albeit at a low level. It is true that the *Case-Shiller* Index of home prices slightly declined in the fourth quarter of 2009, after two positive quarters, and that the number of houses sold was down in January 2010, compared to the previous month. But then again, housing starts augmented more strongly than anticipated. Commercial property construction, in contrast, developed less well, with prices down by 40% since the beginning of the crisis. In February 2010, U.S. Congress experts warned that the slump in mortgage prices could result in high credit default rates.

The annual CPI inflation rate was measured at 2.1% in February 2010, while core inflation fell to 1.3%. In light of the sluggish economic recovery, the Fed expects inflation to fall to an average of 1% year on year. Since December 2008, the federal funds rate, i.e. the U.S. *key interest rate*, has been unchanged at 0% to 0.25%; the Fed intends to keep it at this level for some time. In February 2010, however, the Fed raised the discount rate by 25 basis points to 0.75% “as a further normalization of the Federal Reserve’s lending facilities.” Despite the carefully worded announcement of this measure, credit markets were temporarily unsettled, since they interpreted this step as an overture to monetary tightening. After the discount rate hike and the phasing out of most other liquidity programs for banks introduced during the crisis, the U.S. monetary environment has now almost been restored to precrisis conditions.

The financial market crisis has led to a partial reduction in global imbal-

ances. As a case in point, the U.S. *current account deficit* halved from 6.0% of GDP in 2006 to 3.0% of GDP in the third quarter of 2009. So far, this decline has not been sufficiently persistent to speak of structural change, especially since the current account deficit rose again in the fourth quarter of 2009. The IMF, too, forecasts that deficits will rise again after a temporary decline in 2010.

According to the most recent U.S. Congress prognosis of March 2010, the U.S. *budget deficit* will hit a new post-World-War-II high at 10.3% of GDP in the current fiscal year as a consequence of the deep recession, the massive stimulus packages and rescue measures taken to support the banking system. Fueled by these developments, government debt is likely to balloon from 53% of GDP in 2009 to around 90% by 2020. Fiscal policy measures during and after the crisis, rising public health care and social security expenditure – boosted by demographic developments – are further driving up government debt. Accordingly, the net interest burden will more than double from 1.4% of GDP in 2010 to 4.1% in 2020.

1.2 Japan: Economy Grows Again, Prices Continue to Decline

Following the crisis-induced sharp economic contraction, which hit the country disproportionately hard by international comparison, Japan is presently experiencing a gradual economic recovery unfolding in an environment of global strengthening and recuperating international trade. Mounting by 1.1% quarter on quarter in the fourth quarter of 2009, real *GDP* growth exceeded expectations; from an annual perspective, however, economic performance continued to fall by 5% over the entire year 2009. While all components have recently contributed to this stabiliza-

tion, the most important growth stimulus came from exports. Government stimulus packages have been the mainstay of domestic demand. However, labor market improvements and real income growth are likely to start playing a greater role in driving up private consumption. Unlike in other industrialized countries, the *labor market* in Japan had already reached rock bottom more than half a year ago. At the beginning of 2010, the unemployment rate declined unexpectedly to 4.9%, which means that it is now almost 1 percentage point below last summer's record peak.

Recent *leading indicators* suggest that the recovery is likely to continue in 2010. The *Tankan index*, considered Japan's most important confidence indicator, again showed a powerful increase when it was last published in December 2009. According to the report, the majority of businesspeople continue to be pessimistic about the state of the economy; however, expectations are improving. In February 2010, industrial production and machinery orders also corroborated the upward trend.

Deflationary risks, however, have not been fully headed off yet in Japan. Although the decline in prices is decelerating due to base effects in the energy component, the annual CPI *inflation rate* of January 2010 was still -1.3% . In the fourth quarter of 2009, the GDP deflator reached its lowest mark since 1955 at -3% . Even though the *Bank of Japan (BoJ)* expects the price decline to moderate in the course of 2010, it views the public's declining inflation expectations as a downward risk. International institutions expect prices to continue declining into the year 2011. Unexpectedly, the BoJ put in place a new funds-supply operation in December 2009 after it had started to reduce its

extraordinary *liquidity supply* to banks earlier on in fall 2009. The BoJ has come under increasing pressure from the Japanese government, which is calling for a positive inflation rate. For the time being, the BoJ is likely to maintain its zero interest rate policy (the overnight interest rate has remained at 0.1% since December 2008).

With an estimated debt-to-GDP ratio of 192% in 2009, Japan has the highest level of *national debt* of all industrialized countries in the world. The IMF forecasts that Japanese government debt could rise as high as 246% of GDP by 2014. Nevertheless, the Japanese yen is considered a safe haven. Since the beginning of 2010, the Japanese yen has appreciated significantly against the euro and less so vis-à-vis the U.S. dollar.

1.3 China: Central Bank Takes Corrective Action against Economic Overheating

China's economy has emerged remarkably fast from the crisis. The extensive pump-priming measures, as well as the loose lending policies of the mostly state-owned banks, proved effective. The real GDP growth rate thus came to 8.7% for the entire year 2009 (in the fourth quarter of 2009, year-on-year GDP growth was 10.7%). Industrial output growth was particularly strong. At the end of 2009, production had grown by almost one-fifth year on year. The Chinese purchasing managers' index has remained above 50% for as long as a year now. Industrial sentiment, however, registered a clear setback in February 2010; this points to a slowdown in growth (as is the case in the U.S.A.).

Since November 2009, China has been faced with mounting *inflation rates* again, and annual CPI inflation reached 2.7% in February 2010.

Against this background, the Chinese central bank tightened its *monetary policy* in February 2010 for the second time this year. More specifically, the minimum reserve requirements for large banks were raised in two steps by a total of 1 percentage point and have now reached 16.5% of customer deposits. This tightening was probably triggered above all by concerns about a higher incidence of credit defaults, as the government massively supported new lending during the crisis. Interest rate policy has not been tightened; the key interest rate remains at 5.3%.

At 18% of GDP, China's 2009 *government debt* is low by international comparison. However, this figure must be interpreted with caution, given the issuance of local government debt, which has recently been boosted by investment companies established for this sole purpose.

Year on year, China's high *current account surplus* fell by one-third in the first half of 2009, but remained high at 6.3% of GDP. This decrease stemmed primarily from a slowdown in external demand. Against the backdrop of re-emerging export demand, the overall current account surplus for 2009 rebounded to an estimated 7.8% of GDP. According to the IMF, it will continue to grow in the years to come. However, Chinese imports also rose markedly in 2009, fueling hopes that China can take on a leading role in the recovery process of the world economy.

In April 2010 the U.S.A. will decide whether China will be labeled a "currency manipulator" in the Treasury Department's annual report. This increases the pressure to loosen the renminbi yuan's U.S. dollar peg and to eventually lift it in an orderly fashion.

2 Euro Area Economy Gradually Stabilizes

2.1 Growth Performance Was Disappointing in the Fourth Quarter of 2009

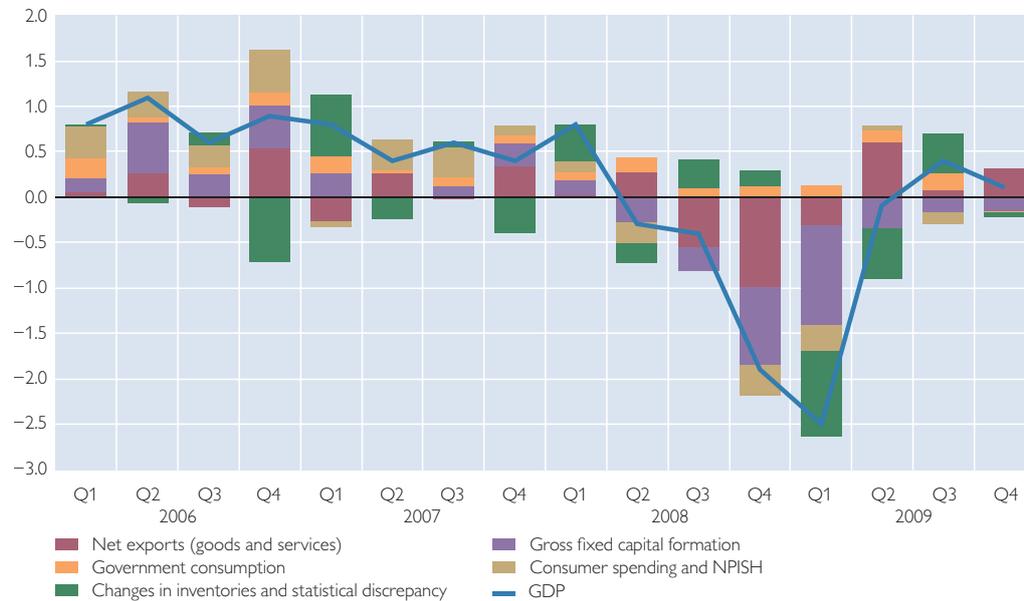
While the world economic recovery gained momentum in the fourth quarter of 2009, the development of economic activity in the euro area has recently remained below expectations. The fourth quarter of 2009 saw a decline in real GDP growth to 0.1%, down from 0.4% in the third quarter. Fourth-quarter economic performance shrank by 2.1% year on year. The *GDP expenditure breakdown* paints a mixed picture: While the strong growth in the third quarter of 2009 was primarily driven by short-term factors (government spending, end of destocking), the fourth quarter saw a slight rise in net exports and private demand.

Household consumption stagnated in the fourth quarter of 2009 after declining in the previous quarter. Against the backdrop of weakening employment and the phasing out of important fiscal stimuli such as car scrapping premiums, personal consumption expenditure can hardly be expected to genuinely propel growth in 2010. Gross fixed capital formation continued to decline, albeit at a slower pace than before. In this area too, there is little hope of the rebound starting soon, given firms' ongoing balance sheet adjustments, low capacity utilization and the decline in construction activity. In the fourth quarter of 2009, public spending declined for the first time since 1999. Only net exports made a positive contribution to euro area growth.

Chart 2

Contribution to Real GDP Growth in the Euro Area

Quarterly changes in percentage points and in %



Source: Eurostat.

The slow pace of euro area growth derives from increasingly *heterogeneous developments in the economic activity* of the single currency area. Euro area countries have been recovering at different rates since the economy hit bottom in the first quarter of 2009. Germany and France were the first to pull out of recession in the second quarter of 2009. In the third quarter of 2009, growth seemed to pick up, particularly in Germany, and in the fourth quarter, euro area growth was most dynamic in France. Overall, Germany and France have grown at similar rates since the economic trough (around 1.1% and 1.2% respectively); whereas Italy, Spain and Greece have not yet emerged from recession. Lately, Spanish GDP has contracted at a significantly slower pace, whereas GDP in Greece slipped more rapidly after the second quarter of 2009. These developments are related to a number of factors. On the one hand, the growth engines – either

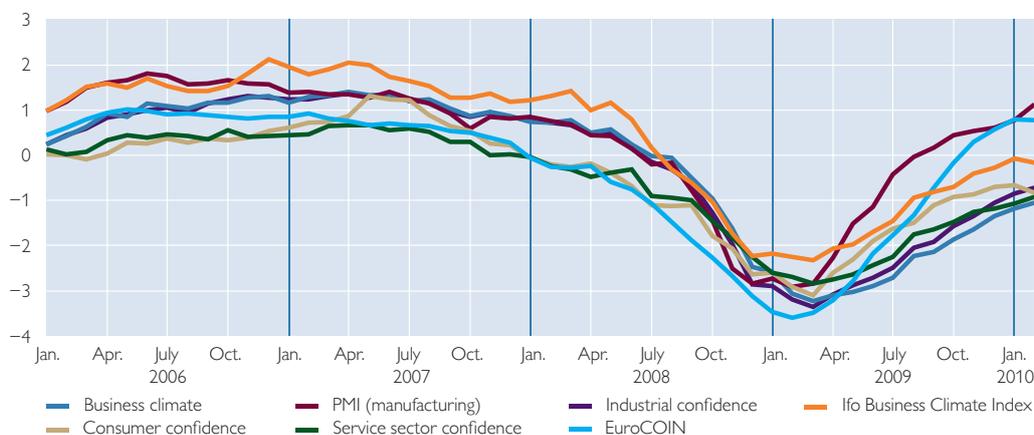
exports or domestic demand – differ from country to country. On the other hand, different schedules of government stimulus programs (such as scrapping premiums) have an impact on the timing of the economic recovery. Furthermore, the European peripheral countries are facing greater internal and external rebalancing needs than the core countries.

2.2 Leading Indicators Paint a Mixed Picture

Whereas the leading indicators of economic activity confirm that a trend reversal took place in spring 2009, recent signs are sending a mixed message. On the one hand, the recent rise in *industrial production* as well as upward revisions of previous data releases suggest that the industrial recovery in the euro area is more resilient than expected. The European Commission's *Economic Sentiment Indicator* and the manufacturing sector's *Purchasing*

Business Climate Indicators for the Euro Area

Deviation from the mean value of the indicator relative to the standard deviation



Source: European Commission, NTC, Ifo, FTD, CEPR, Eurostat, OeNB.

Managers' Index also confirm that sentiment among manufacturers brightened further in February 2010.

On the other hand, the previous ascent of survey-based confidence indicators in nonmanufacturing sectors is flattening out. Especially consumer and retail confidence worsened again in February.

According to the *Business Climate Index* of the Ifo Institute for Economic Research, the majority of surveyed businesses (especially in the retail sector) consider the current situation unfavorable, but businesses were increasingly upbeat regarding the future.

2.3 Unemployment Has yet to Peak

The repercussions of the crisis have reached the *labor market* with the usual time lag. The unemployment rate in January 2010 was 9.9%, around 1½ percentage points higher than a year earlier. The rise in unemployment was particularly strong in countries undergoing construction sector restructuring: In Spain, the seasonally adjusted unemployment rate has doubled over the past 1½ years (to 18.8%); in Ireland it has almost tripled since the begin-

ning of 2008 (to 13.8%). By contrast, the German labor market has so far remained relatively stable: Mainly thanks to flexible *working time reduction schemes*, unemployment has hardly risen (currently 7.5%) in spite of the above-average decline in GDP. Especially the government-subsidized short-time working scheme proved effective, alongside companies' individual arrangements. Although unemployment growth has recently eased in the euro area, joblessness is likely to peak only in the course of 2011. According to its latest forecast, the European Commission expects unemployment to amount to 10.7% in 2010 and to 10.9% in 2011.

2.4 Forecasts Predict a Slow and Uneven Recovery

Recent *forecasts* predict an ongoing revival of economic activity in the euro area over the next few quarters, but at a slow and uneven pace. Growth predictions for 2010, which have mostly been revised upward since fall 2009, range from +0.7% to +1.3%. At the lower bound of the range, there is the current *interim forecast* of the European Commission, which has remained un-

changed from fall 2009 in spite of an improved international environment. Nor have ECB experts revised upward their March 2010 projections for the year 2010 from the December 2009 projections. For 2010, ECB forecasters expect real GDP gains in the range of +0.4% to +1.2%. Forecasts of economists in the private banking sector are also unlikely to be revised further upward any time soon.

Export demand will continue to rise, further buoying the recovery. In the short run, fiscal stimuli will also strengthen domestic demand, but they are unlikely to have a lasting effect. Moreover, the need to adjust private sector balance sheets and the consolidation of public finances will act as a damper on domestic demand. All economic institutes consider that the *risks* surrounding the respective forecasts are largely balanced, while stressing that uncertainty is significant. ECB experts forecast growth to be between +½% and +2½% in 2011; this reflects a slight upward revision compared to the December 2009 projections.

2.5 Start of Fiscal Consolidation Planning

According to available stability programs, the *budget deficit* within the euro area will increase from 2.0% of GDP in 2008 to 6.1% in 2009 and 6.5% in 2010. In 2010, none of the Member States will be able to keep budget deficit growth below the Maastricht threshold of 3% of GDP. The European Council has determined that excessive deficits must be reduced below the 3% mark by 2013. In the meantime, the corresponding excessive deficit procedures have been initiated and are being negotiated in detail. Developments in the budget deficit of *Greece* have turned out to be particu-

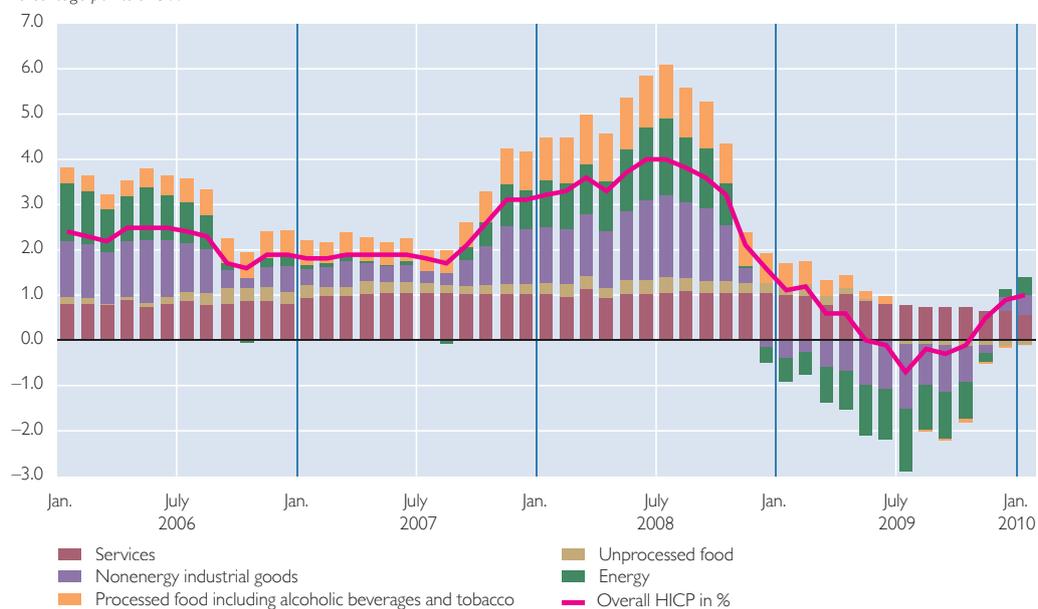
larly problematic. The financial markets' strong reaction to the Greek government's acknowledgement of repeated irregularities in reporting key statistical data to Eurostat showed two things: first, that there is a need for unwavering consolidation of Greek public finances – according to the Greek stability program, the budget deficit of 12.7% of GDP in 2009 will be reduced to 8.7% of GDP in 2010 and below the 3% ceiling as soon as 2012 – and second, that refinancing problems of a Monetary Union member state will ultimately entail difficulties for the euro area as a whole.

2.6 Positive Inflation Rates Return; Core Item Prices Fall Further

Annual HICP *inflation* turned positive in November 2009 as a result of upward base effects in commodity components and was registered at 0.9% in February 2010. However, the disinflation process of HICP core items (HICP excluding energy and unprocessed food items) has continued. In February 2010, core inflation fell to 0.8% against the previous year. Much of this substantial decline can generally be explained by the growing output gap, which was caused by the marked recession during the first half of 2009 and subdued growth perspectives, low capacity utilization as well as mounting unemployment. If the hoped-for revival of economic activity materializes, the output gap will gradually close, raising the pressure on the price of core components. In the immediate future, however, the supply chain is unlikely to exert any upward pressure on the core inflation rate. Although slightly weaker than in 2009, the base effects in commodity components will probably make a nonneglectable contribution to headline inflation in 2010.

HICP Components

Percentage points and %



Source: Eurostat.

As conditions on the inflation-linked bond markets increasingly return to normal, the *inflation expectations* of financial markets can be more readily interpreted. Taking into account persisting disruptions, the current yield curve suggests that although the crisis has amplified volatility, it has not caused a shift in longer-term inflation expectations, which have remained in line with the ESCB's objective of price stability. Consumers' short-term inflation expectations (survey-based price expectations for the next 12 months; European Commission) have been continuously mounting after bottoming out in August 2009. In February 2010, the index value was zero, which implies that the number of respondents who expected prices to fall or remain unchanged was about equal to the number of those who expected them to rise.

In line with current forecasts of international institutions, HICP inflation is expected to be slightly above 1% in 2010; in 2011 it might accelerate to

1.5%. In its latest forecast, the European Commission expects the 2010 inflation rate for the euro area to remain unchanged at 1.1%; the ECB's forecasts range between 0.8% and 1.6%. Overall, there are neither pronounced inflation nor deflation risks in the foreseeable future. Downside risks relate in particular to the outlook for economic activity, while upside risks relate to higher-than-expected commodity prices. The crude oil price has only moved marginally since October 2009, and crude oil futures suggest that the oil price will remain within the range of USD 70 to USD 80 per barrel also in 2010. Furthermore, increases in indirect taxation and administered prices may be stronger than currently expected owing to fiscal consolidation. Recently, price pressure from the external environment, too, has increased somewhat. Thus, the *euro* lost some of its strength against the U.S. dollar in recent months, given the financial markets' concerns about Greece and

the sluggish economic developments. The euro's exchange rate against the U.S. dollar is currently down by 10% from its record marks of early December 2009. The single currency also lost ground against the Japanese yen and the Swiss franc while remaining stable vis-à-vis the pound sterling since the beginning of 2010. Overall, the nominal effective exchange rate of the euro has depreciated over the recent months, which will probably help strengthen European exports. In comparison with recent years, however, the single currency's exchange rate is still at a very high level.

2.7 Interest Rates Remain at a Low Level

At its last meeting on March 4, 2010, the Governing Council of the ECB decided to leave the *interest rate* on the main refinancing operations of the Eurosystem, as well as the interest rates on the marginal lending facility and the deposit facility, unchanged at 1.00%, 1.75% and 0.25%, respectively. Furthermore, the Governing Council decided to continue to gradually phase out its *special liquidity policy measures*. On the one hand, main refinancing operations and refinancing operations with a maturity of one month² will continue to be conducted as fixed rate tenders with full allotment for as long as necessary, and at least until October 2010. On the other hand, as of April 28, 2010, regular longer-term refinancing operations with a maturity of three months (LTROs) will be conducted as variable rate tenders again. In accordance with the decision on the 12-month LTRO of December 2009, the Governing Council of the ECB decided that the next six-month operation will be conducted with a path-depen-

dent rate, the average minimum bid rate of the main refinancing operations conducted during the lifetime of this six-month operation. Thanks to this decision, the euro area banking system will continue to receive liquidity for a prolonged time at very favorable conditions, in turn promoting lending to the euro area economy and therefore further supporting the economic recovery. At the same time, the decision pre-empted distortions which could arise from an unduly long maintenance of extraordinary liquidity measures.

In light of the high levels of excess liquidity, the *EONIA* rate has followed the interest rate on the deposit facility since the first longer-term refinancing operation was conducted. This caused the overnight rate to drop clearly below the rate on the main refinancing operations (0.34% on March 19, 2010).

Growth of the *monetary aggregate M3* has slowed continuously since the onset of the crisis and had even turned negative by the end of 2009. In January 2010, annual M3 growth turned positive again at 0.1%. However, the underlying pace of monetary expansion is likely to remain moderate or to return to negative levels. This development stems from the current yield curve. The low remuneration of short-term deposits as well as the recovery of stock and capital markets have made investments outside M3 more appealing. The small interest rate spreads between the different kinds of short-term deposits favored a reshuffling inside this aggregate toward the most liquid components of M1.

Yield differentials for government bonds in the ten-year segment between Germany and other euro area countries have widened, above all reflecting concern about the fiscal situation in Euro-

² Refinancing operations with a special term of one reserve maintenance period.

pean peripheral countries – especially in Greece, Ireland, Spain and Portugal (in Greece, the spread even exceeded 300 basis points). In view of the austerity packages announced by the Greek government and the many support measures taken, risk premiums diminished again in the middle of March 2010.

3 Economic Developments in Central, Eastern and South-eastern Europe

3.1 Economies Stabilize in the Second Half of 2009

Following a serious economic downturn at the beginning of 2009, the Central, Eastern and Southeastern European (CESEE) EU Member States entered a period of economic stabilization in the second half of the year, recording marginally positive average growth rates in both the third and fourth quarters of 2009 (on a quarterly basis).

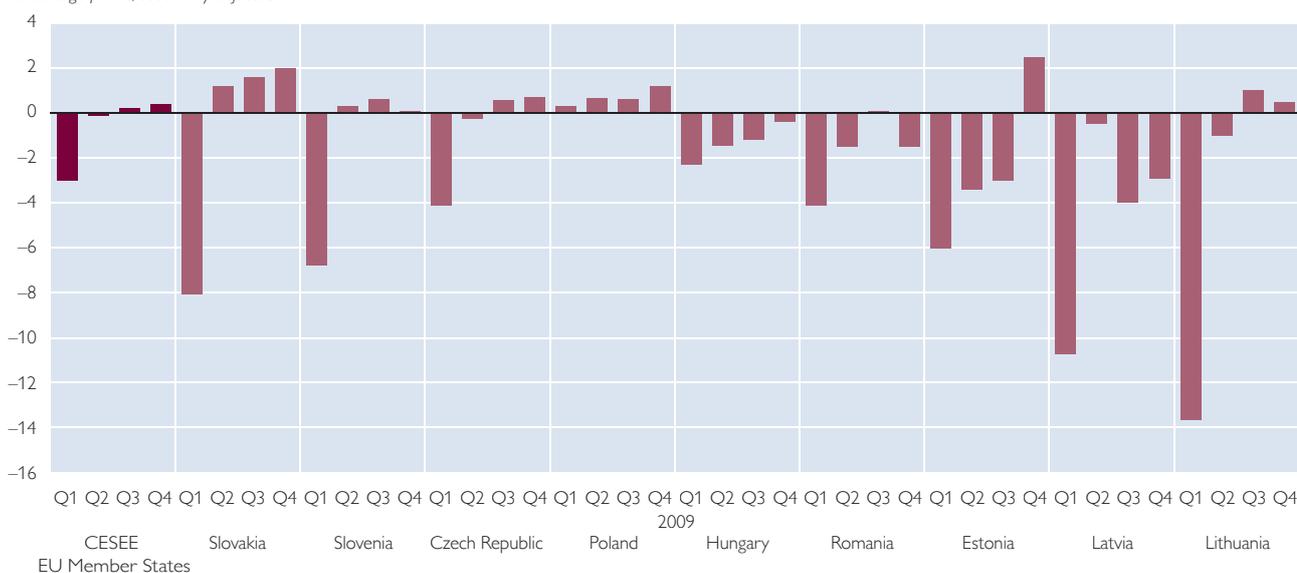
The stabilization was primarily driven by a turnaround in the inventory cycle as well as by external sector developments. Net exports benefited from a pronounced slump in import demand (particularly demand for capital goods) owing to weak domestic activity and a marginal revival of exports-to-GDP ratios against the background of slightly increasing international demand. The other GDP components hardly made positive contributions to growth – with a few exceptions such as, in particular, consumption, which moderately supported growth in Poland and Slovakia.

Thus, across large parts of the region, economic recovery strongly depends on temporary factors and on developments in the euro area, which is their most important trading partner. Therefore, the economic outlook for the CESEE region continues to be surrounded by uncertainty, as confirmed by the latest growth figures on Romania, where growth decelerated in

Chart 5

GDP Growth on a Quarterly Basis

Percentage points, seasonally adjusted

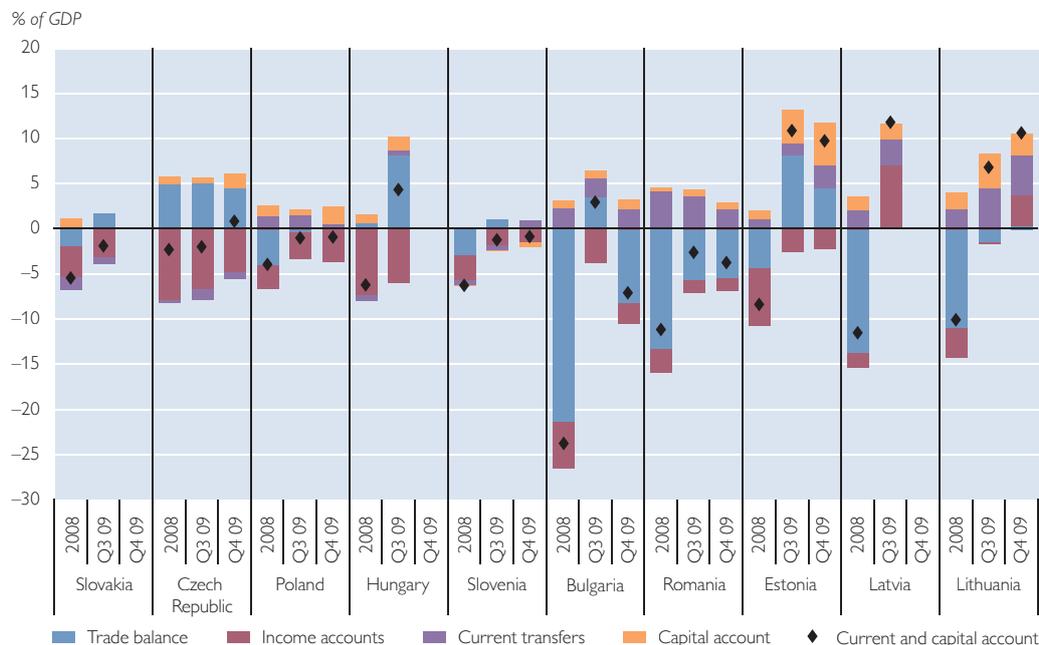


Source: Eurostat.

Note: Eurostat does not publish seasonally adjusted data on Bulgaria, which is therefore not included in the CESEE EU Member States aggregate.

Chart 6

Developments in the Current and Capital Accounts



Source: National central banks.

the fourth quarter of 2009, resulting in a significantly negative growth rate. Both in Slovenia and Lithuania, economic activity lost some of its momentum as well.

In general, cyclical developments differ widely across the region: Poland, for example, was the only country in the CESEE region – and indeed in the EU – to post a positive growth rate for 2009 as a whole. Conversely, the recession was particularly strong in the three Baltic countries, whose economic performance for the entire year of 2009 contracted by well over 10% (by as much as 18% in Latvia), marking the sharpest recession within the EU by far. The reason for these heterogeneous developments is above all to be found in the varying extent of internal and external imbalances that have built up over the past few years; as a consequence, the individual countries' vulnerability to sudden changes in international framework conditions varies as well.

3.2 Economic Imbalances Diminish Markedly

In all CESEE EU Member States, the above-mentioned imbalances decreased significantly during the recession. Particularly the high current account deficits of some countries went down markedly in the course of 2009 and in some cases, current accounts even closed with a surplus. Current account balances were boosted by improved trade balances, which in turn reflect the trends in net exports as stated in the national accounts. To a lesser extent, income accounts played a role as well, recording the favorable effects of a decline in outflows of direct investment income.

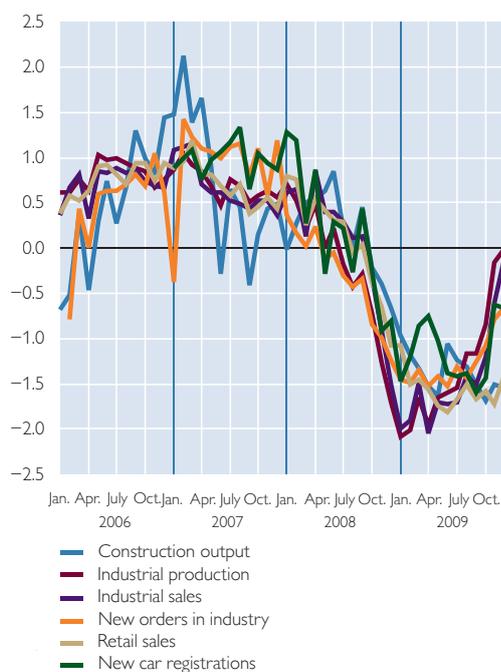
3.3 Further Recovery in 2010 Expected to Be Gradual

Key leading and confidence indicators suggest a further – but most likely only gradual – improvement of economic activity in the coming quarters. With exports beginning to pick up again and

Development of Key Leading and Confidence Indicators for the CESEE EU Member States

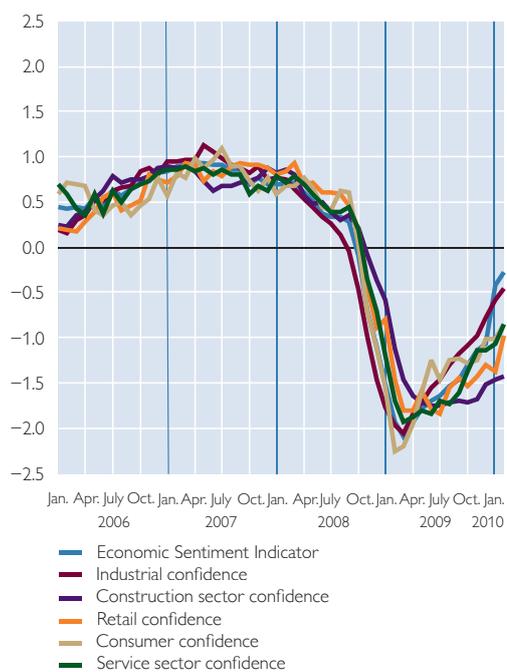
Leading Indicators

Deviation from mean indicator value relative to the standard deviation



Confidence Indicators

Deviation from mean indicator value relative to the standard deviation



Source: Eurostat, European Commission, OeNB.

inventories starting to be replenished once more, industry, in particular, has recovered from the severe slowdown registered in early 2009. Retail trade and construction, however, have clearly seen a below-average performance.

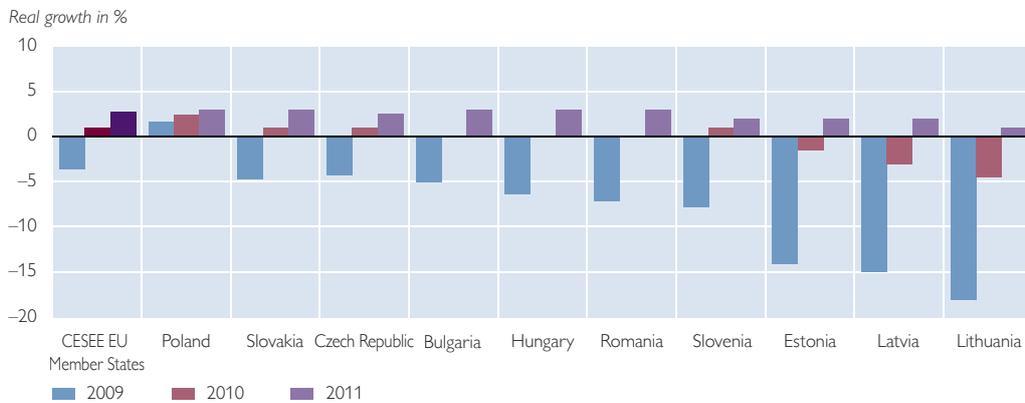
Moreover, numerous indicators have remained below their long-term average, some of them significantly so. What may be expected, therefore, is a subdued recovery (at least in the short term), but not a strong, self-sustained upswing. Still weak international demand as well as – in part – more difficult financing conditions continue to impair investment activity. The persistent deterioration of the labor market situation, partly falling real wages and higher private household debt are dampening private consumption. Moreover, heightened uncertainty

about the real economic impact of the significant recession-induced deterioration in the quality of CESEE banks' credit portfolios prevails.

Therefore, current forecasts expect GDP to grow by no more than around 1% on average in 2010. Growth is likely to proceed at different speeds, however: While GDP will go up moderately in most Central European countries in 2010, economic developments are prone to stagnate in Bulgaria, Romania and Hungary. Economic activity in the Baltic countries, however, is expected to keep contracting. Positive economic growth in all countries of the region is forecast for no sooner than 2011; most outlooks agree that the average growth across the entire region is then likely to be close to 3% (as long as the global – and especially Western

Chart 8

Current GDP Forecasts for the CESEE EU Member States



European – economic environment is characterized by a gradual recovery).

It is unlikely, however, that growth rates in the CESEE region will reach precrisis levels in the medium term. The IMF forecasts average growth to come to around 4% for the 2012 to 2014 period compared to more than 6% in the boom years before the crisis. Nevertheless, after a temporary interruption, the region's economic catching-up process will continue from 2011 onward, and the growth differential to the euro area will widen to around 2 to 2.5 percentage points according to IMF forecasts.

While the crisis hardly impaired the process of income convergence with the EU average for Poland, Slovakia and the Czech Republic – against the background of the recession in Western and Southern Europe, the catching-up process even accelerated in Poland – the Baltic countries in particular were thrown back for several years in their economic development.

3.4 Inflation Declines Significantly in the Region

In all countries across the region, price pressures have decreased in the last few

months, significantly in some cases. Average annual inflation went down from 6.2% for 2008 as a whole to 2.7% in February 2009. This subdued price development is primarily attributable to the economic slump and the related, increasingly negative output gap. Thus, the decline in core inflation roughly matched that in headline inflation; disinflation was not equally pronounced across countries, however. In countries with a fixed exchange rate regime (i.e. in Bulgaria and the Baltic countries), inflation fell significantly more strongly than in the other countries in the region. While the first group of countries recorded a decline in inflation by more than 10 percentage points (almost 20 percentage points in Latvia) against 2008, the comparable reduction for the remaining countries in the region came to no more than 4 to 6 percentage points. Most likely, these differences can be traced both to the particularly strong economic downturn in most of the countries with a fixed exchange rate regime and to exchange rate effects.

Poland and Hungary are the only countries under review that did not register a significant drop in inflation:

Table 1

Price Developments in the CESEE EU Member States

	2008	2009	Sep. 09	Oct. 09	Nov. 09	Dec. 09	Jan. 10	Feb. 10
<i>Annual rate of change in the HICP in %</i>								
Bulgaria	12.0	2.5	0.2	0.3	0.9	1.6	1.8	1.7
Estonia	10.6	0.2	-1.7	-2.1	-2.1	-1.9	-1.0	-0.3
Latvia	15.3	3.3	0.1	-1.2	-1.4	-1.4	-3.3	-4.3
Lithuania	11.1	4.2	2.3	1.0	1.3	1.2	-0.3	-0.6
Poland	4.2	4.0	4.0	3.8	3.8	3.8	3.9	3.4
Romania	7.9	5.6	4.9	4.3	4.6	4.7	5.2	4.5
Slovakia	3.9	0.9	0.0	-0.1	0.0	0.0	-0.2	-0.2
Slovenia	5.5	0.9	0.0	0.2	1.8	2.1	1.8	1.6
Czech Republic	6.3	0.6	-0.3	-0.6	0.2	0.5	0.4	0.4
Hungary	6.0	4.0	4.8	4.2	5.2	5.4	6.2	5.6
Entire region	6.2	3.4	2.9	2.5	2.9	3.0	3.1	2.7
Euro area	3.3	0.3	-0.3	-0.1	0.5	0.9	1.0	0.9

Source: Eurostat.

In Poland, the national currency depreciated particularly strongly at the end of 2008 and the beginning of 2009; moreover, the economic crisis clearly did not hit Poland as hard as it hit the other CESEE countries, and in Hungary, a rise in indirect taxes (inter alia of the value added tax, from 20% to 25%) as of July 2009 caused an additional upsurge in prices. In Estonia, Latvia, Lithuania and Slovakia, price levels fell in February 2010 (year on year).

The central banks in the region reacted to recent inflation developments and the reduced medium-term inflationary risks as well as to declining risk premiums by easing monetary policy. Thus, in 2009 Hungary reduced the key interest rate by 375 basis points, Romania by 225, Latvia by 200, Poland by 150, and the Czech Republic by 125 basis points, respectively.³ Since the beginning of 2010, Hungary (-50 basis points), Romania (-100 basis points) and Latvia (-50 basis points) have eased monetary policy further.

4 Austria's Economy to Remain on a Robust Growth Path in the First Half of 2010

4.1 The Austrian Economy Contracted by 3.5% in 2009

According to national accounts data, in the fourth quarter of 2009 Austrian economic activity picked up 0.4% against the previous quarter (in real terms, seasonally and working day-adjusted). For 2009 as a whole, Austrian GDP growth posted a 3.5% contraction against the previous year (-3.6% in unadjusted terms).

Broken down by demand components, Austria's quarterly national accounts data show that the economic downturn – reflected in negative GDP growth rates since the third quarter of 2008 – was primarily triggered by a strong decline in exports and exacerbated by a significant reduction of investment. Featuring low but positive growth rates, by contrast, private consumption acted as a pillar of growth. Thus, the two halves of the year showed opposing growth trends: In the first

³ The key ECB interest rate applies in Slovenia and Slovakia; no key interest rates apply in Bulgaria, Lithuania and Estonia because these countries operate currency boards.

Table 2

Results of the National Accounts for the Fourth Quarter of 2009

	GDP	Private consumption	Government consumption	Gross fixed capital formation	Exports	Imports
Quarterly change in %						
Q1 08	1.2	0.1	-1.0	1.2	1.4	-0.5
Q2 08	0.2	0.1	2.7	0.4	-0.5	-0.0
Q3 08	-0.6	0.1	-0.8	-1.5	-2.7	-3.0
Q4 08	-1.3	0.1	1.6	-2.9	-5.9	-4.2
Q1 09	-2.2	0.2	-1.5	-3.3	-7.3	-5.7
Q2 09	-0.5	0.3	0.3	-1.2	-2.9	-2.7
Q3 09	0.5	0.3	1.6	-1.1	0.7	0.4
Q4 09	0.4	0.2	0.1	-1.6	1.6	1.1
Annual change in %						
2006	3.4	1.9	2.5	0.7	7.8	5.5
2007	3.4	0.8	2.0	3.2	9.1	6.7
2008	1.9	0.5	3.0	0.4	0.6	-1.6
2009	-3.5	0.7	0.9	-7.7	-14.1	-11.6

Source: Eurostat.

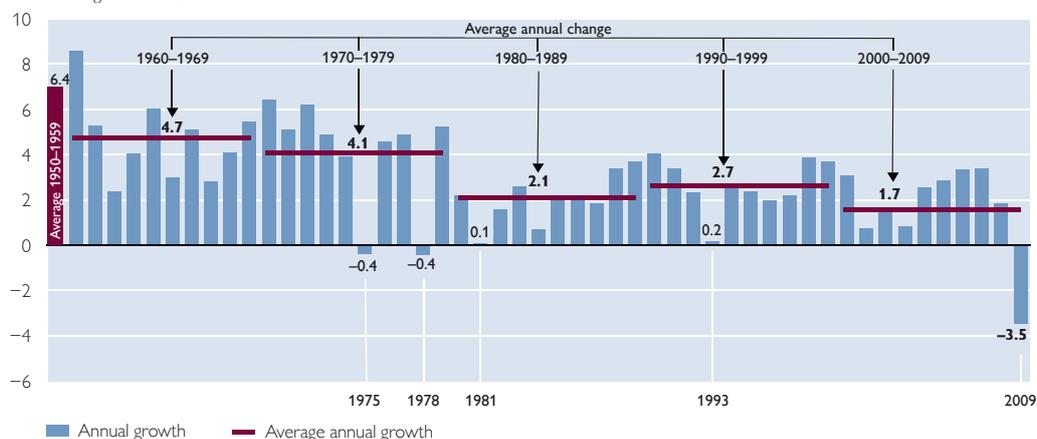
half of 2009, economic performance slowed down markedly in the wake of the global financial and economic crisis. In the second half of 2009, however, the Austrian economy posted robust growth rates just below the long-term average. Still, developments in the second half of the year did not suffice to offset the severe year-on-year slump in GDP, as shown in chart 9, which displays both the real annual

GDP growth rates recorded in Austria since 1960 and average GDP growth per decade. It also shows the unusual extent of the current crisis, given that from the end of the Second World War until 2009, Austria had only twice recorded a fall in real GDP growth in annual terms (in 1975 and in 1978), and even then the contraction had been very moderate.

Chart 9

Economic Growth in Austria since 1950

Annual change in real GDP in %



Source: Eurostat, WIFO.

Results of the OeNB Short-Term Economic Indicator of March 2010¹

The robust development of the Austrian economy is likely to continue in the first half of 2010. According to the OeNB's latest short-term indicator results of March 2010, real GDP growth in Austria can be expected to come to 0.5% in both the first and second quarters of 2010 (seasonally and working day-adjusted, on a quarterly basis). Thus the Austrian economy will remain on the growth path it embarked on in the third quarter of 2009.

Short-Term Outlook for Austria's Real GDP in the First and Second Quarters of 2010 (seasonally and working day-adjusted)

2008				2009				2010	
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Year-on-year quarterly change in %									
3.1	2.9	1.9	-0.5	-3.8	-4.6	-3.5	-1.9	0.8	1.9
Quarterly change in %									
1.2	0.2	-0.6	-1.3	-2.2	-0.5	0.5	0.4	0.5	0.5
Annual change in %									
1.9				-3.5				x	

Source: OeNB – Results of the OeNB short-term economic indicator of January 2010, Eurostat.

The majority of leading indicators are clearly pointing upward, suggesting robust economic growth. An analysis of demand components reveals the following: Currently available monthly data on retail sales, new car registrations and developments in tourism point toward continued moderate growth in private consumption, despite the dampening effect of rising unemployment. At the time being, low capacity utilization, the still difficult financing conditions and high medium-term risks to economic growth indicate that investment activity will remain subdued also in 2010. Owing to the negative carryover effect from 2009, gross fixed capital formation will – at best – stagnate in 2010 as a whole. The current economic momentum is primarily based on export developments, which are benefiting from the renewed uptrend in the international economy. Moreover, the depreciation of the euro recorded over the past few weeks will buoy export activity in the coming quarters. If Austrian economic growth maintains its current momentum, GDP can be expected to climb by around 1½% during 2010 as a whole. It cannot be excluded, however, that growth will slow down markedly toward the end of the year as temporary growth factors unwind.

¹ The next release of the OeNB's short-term economic indicator is scheduled for July 2010.

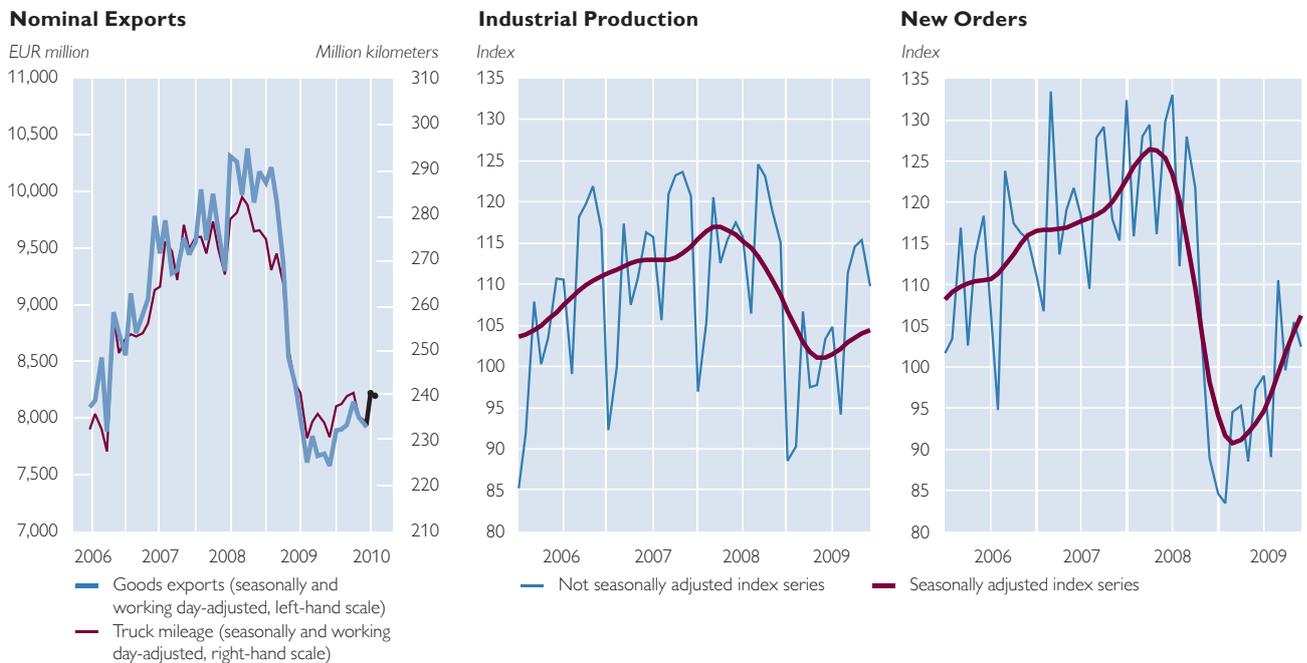
4.2 Export, Industrial and Confidence Indicators Point to Strong Growth

The factors that had been driving the Austrian economy in the fourth quarter of 2009 continue to play a key role in the persistently robust growth expected for the first half of 2010. Having reduced their inventories during the crisis, Austrian enterprises are now building them up again. Moreover, ex-

ports picked up swiftly as the international economy gathered steam, with Austrian exporters benefiting from the declining external value of the euro and from improving order book levels.

Based on these developments, the current results of the OeNB's export indicator for January and February 2010 point to a rise in goods exports in nominal terms (chart 10, left-hand panel) by 1.2% and 2.4%, respectively

Development of Selected Economic Indicators for Austria



Source: ASFINAG, Statistics Austria, OeNB.

Note: The last two values for goods exports are forecast values.

(seasonally and working day-adjusted, quarter on quarter). On a year-on-year basis, the growth of seasonally adjusted goods exports will accelerate from 2.9% in January 2010 to 7.6% in February 2010. Apart from the economic recovery, this uptrend is primarily attributable to base effects, however. In February 2010, the level of goods exports will remain close to 20% below the peak value recorded in April 2008. Nevertheless, this corresponds to an almost 10% rise against the low of June 2009.

Echoing the development of exports, the curves of industrial production and new orders are U-shaped and V-shaped, respectively, reaching a low in early summer 2009 (chart 10, middle and right-hand panels). Despite the recovery recorded over the past six months, both industrial production and new orders are far from their reaching precrisis high. Moreover, setbacks have

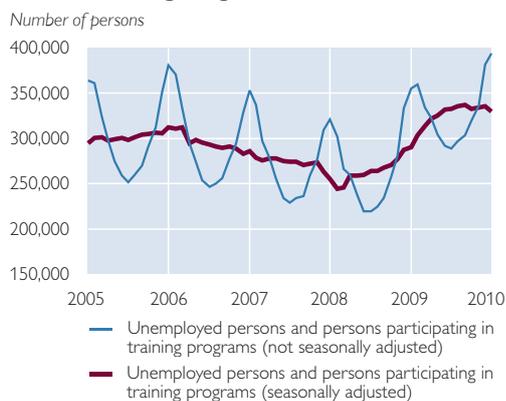
been reducing the speed of the recovery process again and again. Posting a decline against the previous month (quarter on quarter) in December 2009, industrial production was especially hard hit. For the first time in many months, new orders, by contrast, showed a pronounced increase again in December 2009 (year on year). While this upturn was above all attributable to new orders from abroad, new domestic orders also increased for the first time since August 2008 (year on year). Developments in both cases were attributable primarily to a pronounced base effect, since order books had already deteriorated strongly in December 2008.

4.3 Rise in Unemployment Rate (Eurostat Definition) Slows Down

Currently, Austrian labor market data do not indicate a clear trend: On the

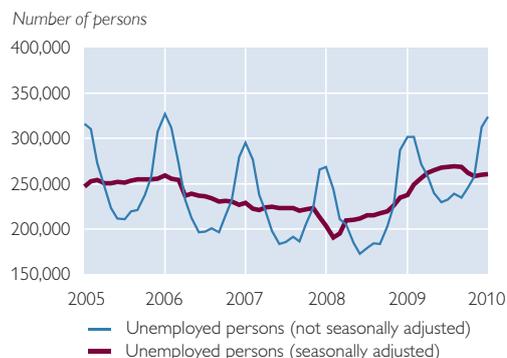
Unemployment Developments in Austria

Registered Unemployment as Recorded by the AMS and Number of Persons Participating in AMS Training Programs



Source: Statistics Austria.

Registered Unemployment as Recorded by the AMS



one hand, the unemployment rate as defined by Eurostat went down from 5.6% in October 2009 to 5.3% in January 2010. On the other hand, seasonally adjusted registered unemployment as recorded by the Austrian Public Employment Service (AMS) has been increasing slightly, coming to 7.4% in January 2010, up from 7.3% recorded between August and December 2009. The number of registered unemployed also conveys mixed signals. As chart 11 shows, seasonally adjusted unemployment had peaked by summer 2009, went down slightly after that and has been moving sideways since December 2009. However, the number of unemployed persons, including those participating in AMS training programs, continued to rise.

Weather conditions caused the number of unemployed persons (including persons participating in AMS training programs and persons placed on short-term working schemes, on a pro-rata basis) to peak at 412,490 in absolute terms in January 2010. Over the past few months, enterprises relied on short-term working schemes to an ever lesser extent. Mid-2009,

around 55,000 persons in approximately 320 enterprises were reported to have been put on a short-term working contract. By March 2010, their number had halved to around 24,700 in 217 enterprises.

4.4 HICP Inflation Rises Slightly in Early 2010

Coming to 0.9% in February 2010 (compared with 1.2% in January 2010), HICP inflation in Austria went down marginally for the first time after the uptrend recorded since September 2009. This recent reduction is mainly attributable to a fall in food, garment and footwear prices. Moreover, fuel prices climbed at a slower pace in February than in January 2010.

In February 2010, like in the two previous months, fuel prices were among the key drivers of inflation, although their contribution went down from 0.4 percentage points in January to 0.3 percentage points in February. Housing rents augmented by 4.7% year on year in February, i.e. at a rate that was also slightly lower than before (5.5% in January). By contrast, developments in prices for food, nonalco-

holic beverages, natural gas (gas providers in three Austrian provinces had reduced prices in November 2009) and education (university tuition fees had been abolished in March 2009 and a free kindergarten year had been introduced as of September 2009) had a dampening effect on inflation in

February 2010. Moreover, substantial month-on-month price reductions for garments and footwear were measured in February 2010, which might be attributable to a base effect of the delayed clearance sale period in winter 2009.

Shocks, the Crisis and Uncertainty about Future Inflation: Theory and Evidence for the Euro Area

Ernest Gnan,
Johannes Langthaler,
Maria Teresa
Valderrama¹

This study is motivated by the recent increase in volatility of both inflation and inflation expectations, triggered initially by the surge in commodity prices and more recently by the global economic crisis. While inflation uncertainty rose only moderately in response to the commodity and energy price shock in 2007, the financial and economic crisis triggered a dramatic increase across all types of agents, which was also reflected in historically large forecast errors. During the final months of 2009, both inflation expectations and uncertainty returned to more moderate levels.

Uncertainty about future inflation may pose a problem both for monetary policy and for economic efficiency at large. Our study shows that various strands of economic theory offer quite diverse explanations for the mechanisms behind the formation of inflation expectations and the associated uncertainty. Our econometric estimates suggest that behavioral heuristics and information constraints or bounded rationality may indeed influence agents' uncertainty about future inflation. For instance, both consumers and professional forecasters seem to invest more effort in forming expectations about future inflation if and when inflation developments become more salient. However, in the case of consumers faced with very large inflation shocks, this effect seems to be dampened by other behaviors. In contrast to consumers, professional forecasters' uncertainty about future inflation reacts to news about the business cycle and monetary policy, which points to their use of a richer data set and more sophisticated models in forming inflation expectations.

JEL classification: E31, E52, D84, D80

Keywords: inflation expectations, uncertainty, behavioral economics, heterogeneous agents

After a decade of stable and low inflation, the past three years have been marked by a sharp increase in inflation volatility worldwide and in the euro area. Initially, a global boost in energy, non-food and food commodity prices drove up inflation to its highest level since the introduction of the euro. This surge in inflation proved to be short-lived, as the financial and economic crisis unfolded, spreading out globally and from the financial to the real sector. The deepest global recession since World War II pushed commodity and energy prices back down and brought about large negative output gaps worldwide. The combined effect was a sharp drop in inflation rates in many countries, even into negative territory for several months in the summer of 2009 (chart 1).

Inflation expectations have reacted to these developments in various ways (chart 2): First, expectations reflected the surge and decline in actual inflation, at least to some extent. Second, the longer the time horizon for expectations, the weaker this effect became; indeed, almost no effect could be detected for very long horizons. Third, consumer expectations reacted more strongly than those of professional forecasters. Fourth, particularly around mid-2009, as the recession deepened and actual inflation (temporarily) entered negative territory in many euro area countries, consumer expectations followed the decline in actual inflation much more closely than professional forecasters' and financial markets' expectations. Fifth, since mid-2009, in-

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Chart 1

HICP Inflation and Historical Volatility in the Euro Area

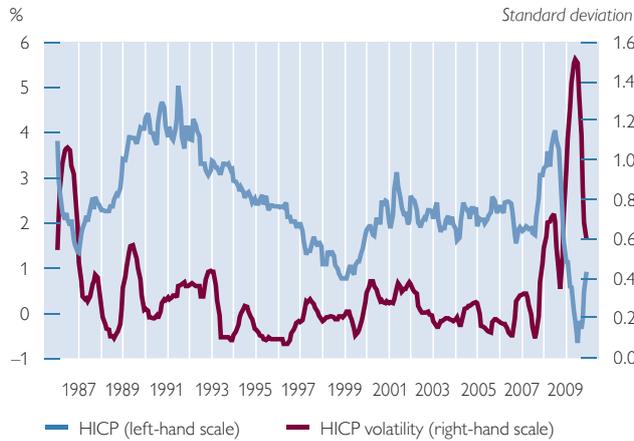
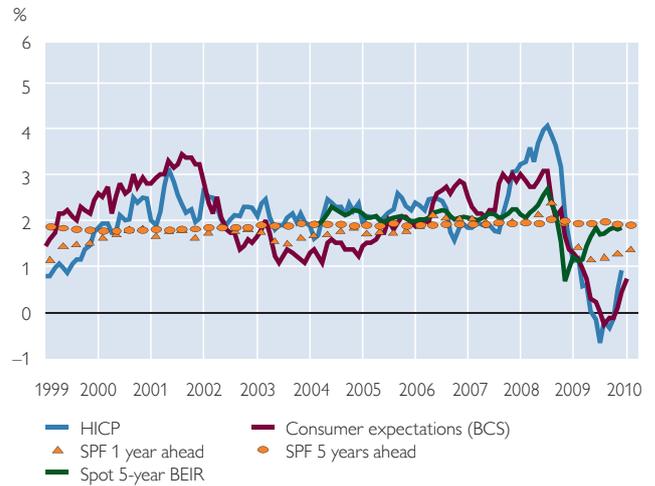


Chart 2

Overview of Inflation Expectation Indicators



Source: OeNB, European Commission, ECB.

Note: SPF stands for the ECB Survey of Professional Forecasters, BCS for the European Commission's Business and Consumer Survey, and BEIR for break-even inflation rate. HICP volatility is measured as the standard deviation of HICP over the past 12 months. Consumer expectations are defined as European consumers' price development expectations for the coming 12 months and gauged to euro area HICP. SPF 1-year ahead forecasts are based on rolling horizons.

flation expectations have again moved upward in line with actual inflation.

The increasing heterogeneity observed in inflation expectations seems to reflect a rise in uncertainty among agents in the face of a dramatic economic shock, the potentially far-reaching consequences of which are exceptionally hard to gauge. This notion is underpinned by the parallel existence of sharply contrasting scenarios for the future development of inflation in both the public and academic debate. Current scenarios range from long-lasting depression-deflation scenarios at one extreme to fears of a sharp rise in inflation over the medium term.² Therefore, it seems appropriate to conduct a more detailed study of whether – and if so, why – uncertainty about

future inflation has actually increased in response to recent economic shocks and to the financial and economic crisis.

Measuring and understanding the evolution of uncertainty about inflation expectations is relevant for two reasons. First, uncertainty about future inflation affects the decisions of economic agents (as they are unsure about future prices, costs and real interest rates). Lower uncertainty is generally perceived as desirable because it reduces errors in decision making, saves resources devoted to coping with uncertainty about future inflation and allows the economy to reach a higher state of efficiency.³ Second, keeping inflation expectations stable at low positive values is a core element of most central banks' monetary policy strategy

² Such post-crisis high-inflation scenarios are usually based on the perceived inability or unwillingness of central banks to withdraw the large, crisis-induced monetary stimulus in time, and on an expected monetization of sharply mounting government debt. However, such scenarios may also be fueled by public calls to raise the central banks' inflation targets (e.g. Blanchard et al., 2010).

³ For an overview of the costs of inflation uncertainty, see e.g. Golob (1994).

nowadays. Both the initial supply side-driven surge in inflation rates and the ensuing supply and demand side-driven plunge in inflation prompted concerns about an “unanchoring” of inflation expectations, in the first instance to the upside, in the second to the downside (chart 2). These concerns about a destabilization of inflation expectations were among the main reasons behind the initial upward cycle and the ensuing slashing of official interest rates as well as the extension of the expansive monetary policy stimulus by means of unconventional monetary policy measures.

This article aims to shed some light on the forces possibly driving uncertainty about future inflation by combining three perspectives: a theoretical one (section 1), a conceptual and statistical one based on stylized facts (sections 2 and 3), and an empirical econometric approach (section 4).

Section 1 surveys the rather scarce theoretical and empirical economic literature on uncertainty about future inflation and identifies different strands of literature on the topic. In particular, the literature on behavioral economics is screened for its usefulness in explaining the formation of inflation expectations during times of economic stress (*shocks, crises*). For most of these theories, inflation uncertainty depends not only on the level of inflation itself and on the credibility of the central bank, but also on the type of shock hitting the economy and on the current phase of the business cycle. For example, in times of crisis or general uncertainty, agents may update their information more frequently, pay more attention to the available information, or invest more in acquiring information. This would reduce uncertainty. However, if agents follow rules of thumb (heuristics), forecast errors could be amplified

at least for some groups, thus augmenting uncertainty about future inflation.

In section 2, we discuss the measurement of inflation expectations uncertainty based on three approaches: (1) using data on subjective probability distributions as provided by individual respondents in surveys on inflation expectations (only available from the ECB Survey of Professional Forecasters – SPF); (2) exploiting response distributions across individuals from surveys on inflation expectations (e.g. among consumers); and (3) extracting uncertainty from the volatility of financial market-based indicators of inflation expectations over time. On this basis, we use a broad set of available data sources in section 3 to construct measures of ex ante and ex post uncertainty and to identify stylized facts on recent patterns of inflation uncertainty. In particular, we study the evolution of uncertainty among consumers, professional forecasters and financial markets.

In section 4, the following hypotheses are tested empirically on the basis of the theoretical discussion in section 1: (1) Uncertainty about future inflation rises with the level of inflation; (2) uncertainty is influenced by the business cycle (i.e. the output gap) and by monetary policy (i.e. by the level of short-term interest rates); (3) unexpected shocks to the economy have asymmetric effects on uncertainty due to psychological factors (overconfidence, availability heuristic, salience heuristic, etc.) and/or limitations to full rationality (rational inattention, sticky or costly information, near-rationality). As we study the empirical evidence for the period after 1999, we assume that the credibility of the central bank has not changed substantially and thus does not influence uncertainty over time. Section 5 concludes.

1 Uncertainty about Future Inflation: Some Theories

1.1 Inflation Perceptions – Inflation Expectations – Inflation Expectations Uncertainty

The formation of inflation expectations can be expected to follow complex psychological processes. Inflation as such is already quite an abstract concept, involving the measurement of prices of hundreds of goods and services contained in the consumption basket of the “average” consumer. Over the past years, a growing body of literature on the differences between statistically measured official consumer price inflation and “perceived” inflation (e.g. as derived from the European Commission’s Business and Consumer Survey – BCS) has highlighted the many psychological factors which may come into play in the formation of perceptions about current inflation. Price movements for frequently purchased products, asymmetry in the perception of price increases versus decreases, confirmation biases regarding expected price movements, as well as increased media coverage have been identified as potentially important factors contributing to significant and sometimes rather persistent deviations between “objective” and “subjective” or “perceived” inflation rates (e.g. Fluch and Stix, 2005; Lamla and Lein, 2009).

If psychological factors play such an important role in the formation of contemporaneous inflation perceptions, one might expect such subjective influences to play an even greater role in the formation of inflation expectations. Indeed, since there is no “objective” information on future inflation, forecasts from professional sources, while widely

published, may not necessarily be considered credible in the eyes of other economic agents and may themselves be subject to psychological influences.

Thus, the formation of agents’ inflation expectations involves uncertainty. This uncertainty – be it perceived or actual, *ex ante* or *ex post* – may vary over time depending on economic circumstances and across agents or groups of agents depending on their access to information and their ability and/or willingness to process the available information. While a small but growing stream of economic literature has shed some light on the possible mechanisms at work in the formation of inflation *expectations*, there is no theory that explains how agents’ perceptions about the *uncertainty* surrounding inflation expectations are influenced, just as there are no data that capture this uncertainty. The theories (and the data, as we shall see below) that may explain why uncertainty about inflation expectations increases or decreases over time are derived from theories (and data) about the formation of inflation expectations.

1.2 Modified Rational Expectations versus Behavioral Economics

It is now widely accepted in the economics profession that agents, in particular consumers, do not necessarily form inflation expectations as predicted by the rational expectations model.⁴ As a consequence, uncertainty about future inflation will differ among individuals and over time. Various reasons have been proposed to explain why the formation of inflation expectations may change over time: First, there may be differences among agents and

⁴ For an early empirical rejection of the rational expectations hypothesis regarding inflation expectations based on survey data, see Gramlich (1983).

over time in terms of available information and the effort spent processing that information. Second, agents will use different “models” or “beliefs” in forming expectations about future inflation.⁵

For the purposes of this article, the various strands of economic thinking on these phenomena may be roughly summarized under two broad directions: theories that attempt to extend or modify the standard rational expectations view, and theories based on psychological insights, which are often discussed under the heading of “behavioral economics.”

1.3 Applying Theories that Modify Rational Expectations

Within the first category of theories, the main departure from rational expectations is the assumption of imperfect information and bounded rationality (Simon, 1955) at least for a group of agents. The basic idea is that the costs and benefits of forming rational expectations are recognized and modeled (Curtin, 2006). Sticky information models assume that in each period, only a fraction of the population updates its information on the current state of the economy (Mankiw et al., 2003). In models of costly information acquisition, agents decide whether or not acquiring (additional) information is worth the cost and effort, and as a result they may not use the full set of information available. Under the rational inattention theory, agents have a limited capacity to process information, which initially flows through a “channel” before reaching them. The resulting reduced and “coded” information may be fraught with errors (Sims,

2003). In models of learning, economic agents try to improve their knowledge of the stochastic process of the economy over time as new information becomes available.

Akerlof et al. (2000) propose a model which is particularly relevant to our subject. In their model, some agents form “near-rational” expectations, i.e. they either underweight or, in the extreme, totally ignore inflation when making decisions. Moreover, the incentive to anticipate inflation differs among agents: The proportion of near-rational agents decreases with rising inflation, as more agents find it worthwhile to predict inflation accurately (i.e. to switch to forming rational expectations) at higher inflation rates. Using U.S. consumer survey data in a model which focuses on learning and information stickiness, Pfajfar and Santoro (2006) find that agents are indeed more likely to update information sets regularly when inflation becomes salient.

1.4 Behavioral Economics May Explain Aspects of How Inflation Expectations Are Formed

The second strand of literature explains behavior directly on the basis of psychological factors. In this type of models, agents estimate the probability of future outcomes by non-statistical, subjective means. Such simple “rules of thumb” are known as subjective probability heuristics, and agents employ them in order to simplify the task of processing information. They are usually more explicit descriptions of consumer behavior than the neoclassical theories listed above, but they are more difficult to model and to verify empiri-

⁵ Using consumer survey data for the U.S.A., Branch (2004) finds evidence that different agents consciously choose different models. According to his results, they do not blindly follow ad hoc rules but choose individually optimal models by weighing costs and benefits.

cally.⁶ Heuristics that may be relevant to our question are the availability heuristic, simulation heuristic, associativeness model, salience and representativeness heuristic, confirmation bias, overconfidence, and anchoring and adjustment.⁷

Under the *availability heuristic*, agents predict the probability of an event depending on how easily an example that matches the event can be brought to mind (it is mentally “available”). Thus, for example, an individual’s assessment of future inflation prospects may be influenced by her own life experience (or, for that matter, her knowledge of economic history). In the context of recent shocks, the availability heuristic might explain how inflation expectations could be influenced by whether or not an individual recalled the first and second oil shocks, the Great Depression, or inflation developments after major recessions and large increases in government debt.

Similarly, under the *simulation heuristic*, agents perceive the probability of events depending on the extent to which they can imagine (or “simulate”) the outcome. In the context of recent economic developments, people in 2007 may have had difficulties imagining an oil price of USD 150. Similarly, most people would have had difficulties imagining another Great Depression and an extended period of deflation in 2008 and 2009, since such extreme events were beyond their imaginative faculty.

The *associativeness model* developed by Mullainathan (2002) goes one step further. In this model, current events can resurrect memories of past events

that exhibit similar characteristics. As a result, even objectively irrelevant information, i.e. information which does not alter the likelihood of an event, can influence expectations. The model could, for example, explain how inflation or deflation scares might arise from even vague parallels with past historical episodes or with experience in other countries.

The *salience heuristic* implies that people only pay attention to information that stands out. In a sense, this heuristic is related to models of rational inattention (Sims, 2003) or near-rational models (Akerlof et al., 2000). Applied to inflation expectations, it implies that agents process information about future inflation only when it becomes more relevant, i.e. during periods of high or volatile inflation.

Indeed, a number of studies have analyzed the effect of media reports on inflation expectations. Carroll (2003) uses an epidemiology framework in which households – via the media – revise their expectations probabilistically toward professional forecasters’ views. In an empirical study of U.S. consumers, Carroll shows that differences between households’ and professional forecasters’ views narrow when inflation is more significant, which is consistent with salience heuristics as well as theories based on costly information acquisition, rational inattention or near-rational models. Similarly, Lamla and Lein (2008) find that German consumers make fewer mistakes, and disagreement between consumers and professional forecasters diminishes, when the amount of news about inflation increases. Moreover, they find that

⁶ While they are difficult to express in mathematical models, they are easy to control in experimental settings, which has been done extensively. The theoretical models, on the other hand, have not been studied in laboratory experiments.

⁷ See Camerer and Loewenstein (2004) and Chiodo et al. (2004) for an overview of behavioral economics and some of the most common heuristics.

media reports about rising inflation have a stronger effect than news about falling inflation. While the volume of news information improves the accuracy of consumers' forecasts, the tone of media reports tends to induce a forecast bias. Badarinza and Buchman (2009) investigate the effect of news not only on forecast accuracy but also on disagreement among consumers. For a group of euro area countries and the euro area aggregate, the authors find that an increase in news about inflation reduces disagreement and improves forecast accuracy.

Other heuristics predict different reactions. The *representativeness heuristic* is a rule of thumb by which people update the subjective probability of a hypothesis in the light of new information. Rather than following Bayes' law, however, they do not fully take all new information into account. Applied to inflation expectations, this heuristic may explain sticky or "well-anchored" expectations, even when actual inflation developments or economic circumstances would warrant a (more drastic) revision of expectations. Moreover, this heuristic might also explain why inflation expectations did not completely follow the rise in headline inflation between 2007 and 2008, and why they did not become negative in the summer of 2009.

In a similar vein, *confirmation bias* implies that agents ignore or do not make full use of new incoming information. Instead, they interpret new evidence in a biased way or selectively recall information from memory in order to reinforce their prior beliefs. This heuristic may, for instance, explain the persistent gap between actual and perceived inflation observed around the time of the introduction of euro banknotes and coins in 2002. It also emphasizes the importance of the

central bank's reputation and credibility in public opinion: Once lost, credibility in the eyes of the public would be very hard to regain.

Another related heuristic is *anchoring and adjustment* (Tversky and Kahneman, 1974), according to which agents make estimates based on a starting point (anchor). When they update their subjective probability forecasts on the basis of new information, they tend to bias their estimated probabilities toward the anchor. Central banks rely on this factor to manage inflation expectations. By publicly stating a commitment to price stability with a precise inflation target or definition of price stability, central banks seek to anchor inflation expectations so firmly that they do not change significantly, even if actual inflation temporarily deviates from the target later on (e.g. as a result of shocks). Such anchoring seems to explain Bryan and Palmquist's (2005) finding that the central bank's communication of its inflation objective has an impact on inflation expectations independently of the actual inflation trend.

Overconfidence, a phenomenon in which agents tend to overestimate the accuracy of their information, is particularly relevant in the context of inflation forecast uncertainty. Psychological research has confirmed this phenomenon for most individuals (Thaler, 2000), but it also applies to professional forecasters (Giordani and Söderlind, 2003). The overconfidence heuristic suggests that e.g. during recent crisis episodes, any increase in the observable uncertainty about future inflation (as measured using surveys or financial market indicators) might still underestimate the increase in true uncertainty.

Building on various concepts from behavioral economics and using European consumer survey data, Bovi (2008) finds that consumers are overly

pessimistic about recent developments and at the same time overconfident about future inflation. This “survey forecast error” is greater in bad times than in good times. Thus, after a negative shock, people’s expectations tend to become even more overconfident.⁸ By contrast, Forsells and Kenny (2002) find that the European Commission’s BCS data on inflation expectations provide an unbiased predictor of inflation one year ahead, and that consumers revise their expectations in light of new information. The fact that consumers’ forecasting errors can be explained by a set of macroeconomic variables (in particular monetary and financial variables) indicates that consumer expectations are not fully rational in the sense that they do not account for the full set of information available.

1.5 How Would Theory Predict the Reaction of Uncertainty to Recent Large Shocks?

A common result of the two types of theories discussed above is that due to the incomplete and inefficient use of information, uncertainty about and heterogeneity of inflation expectations are higher than under rational expectations. One can also expect uncertainty to be greater for those groups that have less information or process it less efficiently than the others, and to vary over time depending on factors that would make agents change either their efforts or their models for estimating future inflation. Variables that may have such an effect include the inflation level, the volatility of inflation, changes in the monetary policy regime, shocks to the economy (in particular the size of such shocks) and the resulting volatility of the business cycle, the types of

shocks (demand or supply), the phase of the business cycle, etc.

With respect to recent developments, the various theories and heuristics yield a priori ambiguous conclusions as to the effect of economic shocks on agents’ uncertainty about future inflation. On the one hand, one could argue that shocks which cause inflation to change unexpectedly will also increase uncertainty about future inflation. On the other hand, the theories described above suggest that opposing forces might also be at work: When inflation is low and it may be costly to process information about future inflation, agents do not pay much attention, and disagreement or uncertainty might even increase as a result. In contrast, when large shocks hit the economy or become more salient, agents gather information more actively and carefully, thus reducing uncertainty. During periods of crisis or general uncertainty such as the past three years, agents could update their information more frequently, pay more attention to the available information, or invest more effort in acquiring information; this would serve to reduce uncertainty. But if agents follow rules of thumb (heuristics) such as confirmation bias, simulation heuristics or anchoring, forecast errors could be amplified for at least some groups, which would again increase uncertainty. Determining which of these counteracting effects ultimately dominates is an empirical matter which we explore in section 4.

Before doing so, we will have a look at how to measure uncertainty about inflation expectations and what the available data suggest about recent developments.

⁸ Garcia and Manzanares (2007) find favorable reporting biases in the ECB’s SPF, a phenomenon which has also been observed in the U.S. SPF.

2 Measuring Uncertainty about Future Inflation: Concepts and Data

Uncertainty about future inflation cannot be observed directly. It needs to be derived from other data in a process involving transformations and assumptions which we need to recognize in order to understand the potential information content as well as the limitations inherent in the data derived. In this section, we address two issues: We first provide a conceptual discussion of how to measure uncertainty about future inflation, after which we describe the data sources available for this purpose.

2.1 Three Concepts for Measuring Uncertainty about Future Inflation

The economic literature suggests three approaches to measuring inflation expectations uncertainty: (a) using data on subjective probability distributions as provided by individual respondents in surveys on inflation expectations; (b) exploiting differences across individuals from surveys on inflation expectations; and (c) interpreting variations in inflation expectations over time as indicators of uncertainty. Let us consider each of these approaches in more detail.⁹

(a) Data on subjective probability distributions as provided by individual respondents in surveys on inflation expectations are clearly the first choice – if and when they are available. In this case, uncertainty as perceived by the individual agent is measured directly. It is important to note that what is measured is perceived as opposed to actual uncertainty; forecasters' overconfidence in their own ability to gauge un-

certainty will likely lead to a downward bias in this measure of uncertainty as compared to actual uncertainty. At the same time, it is probably perceived (ex ante) uncertainty about future inflation rather than actual (ex post) uncertainty which governs behavior.¹⁰ One major practical limitation of this approach is the lack of data across a broad set of agents. In fact, the only agents for whom such data are available in the euro area are professional forecasters who participated in the SPF, which the ECB conducts at regular intervals. Individual distribution data can be aggregated in various ways, yielding different measures with different meanings (see notes to chart 7 as well as Bowles et al., 2007).

(b) A second approach is to consider differences in inflation expectations across individuals. This approach assumes that larger differences imply higher uncertainty, a notion based on the idea that differences in inflation expectations across individuals are zero in the extreme case of full certainty. As uncertainty is introduced and increases, different individuals process and interpret the available data differently, yielding different expectations of future inflation. The advantage of this approach is that in addition to the SPF, a vast data set with information on individual inflation expectations is available for the euro area: The European Commission's BCS includes a question on consumers' price expectations over the coming 12 months, thus covering a very important group of agents and enabling comparisons with the expectations of professional forecasters.

A number of methodologies can be used for the quantification of surveys.

⁹ Uncertainty can be measured ex-ante and ex-post. While the indicators used here measure ex-ante uncertainty, ex-post uncertainty can be captured by analyzing forecast errors.

¹⁰ See Thaler (2000) and Giordani and Söderlind (2003).

One of them is the probabilistic approach based on Carlson and Parkin (1975) and developed further by Berk (1999). The basic consideration underlying this method is that respondent's replies (e.g. "inflation will stay about the same") correspond to a certain value of inflation if inflation expectations lie within a certain range bounded by two response thresholds. The thresholds are time-varying and are derived directly from the survey without any need for ad hoc assumptions (e.g. 2%). Assuming a normal distribution in the aggregate probability distribution of opinions on inflation, it is possible to derive the level of expected inflation, its standard error and the two response thresholds. The average value of inflation expectations can be expressed as a function of this range by interpreting the share of respondents in each category as probabilities. The measure of uncertainty used in this

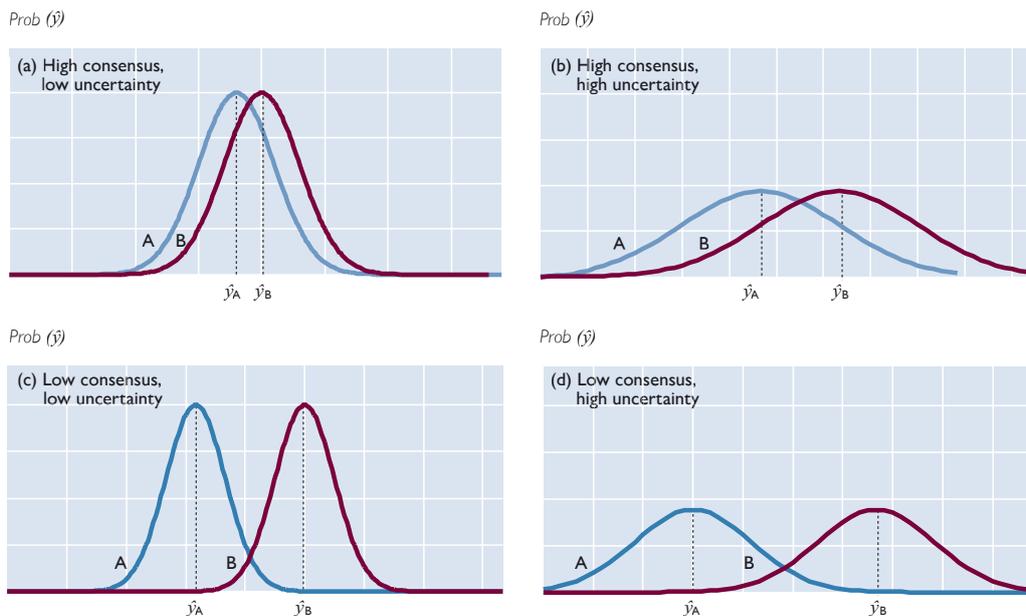
study is derived from the standard deviation of the probability distribution as in Arnold and Lemmen (2006).

One disadvantage of this approach is that higher (individual) uncertainty need not necessarily go hand in hand with higher differences (heterogeneity) in perceptions. Chart 3 aptly illustrates this point: Each of the four panels shows the probability distribution of inflation forecasts for two agents (A and B), with each panel representing a different stylized state of the world. It becomes immediately obvious that, in principle, both high consensus (upper panels) and low consensus (lower panels) can be associated with low uncertainty (left-hand panels) or high uncertainty (right-hand panels).

Giordani and Söderlind (2003) use data from the U.S. Survey of Professional Forecasters (conducted by the Federal Reserve Bank of Philadelphia) to demonstrate that the level of agree-

Chart 3

Individual Uncertainty versus Inter-Individual Differences in Expectations



Source: Zarnowitz and Lambros (1983), adapted.

Note: Curves A and B represent the probability distributions of alternative forecasts from sources A and B. The probabilities $Prob(\hat{y})$ are measured vertically; the different values of the predicted variable (\hat{y}) are measured horizontally. \hat{y}_i ($i = A, B, \dots$) refers to the point forecasts.

gate uncertainty is mostly due to individual uncertainty, while fluctuations in aggregate uncertainty primarily arise from *fluctuations* in disagreement. Thus, they conclude, disagreement may after all be a fairly good (and more readily available) proxy for the theoretically more appealing measure of individual uncertainty.

(c) The third approach captures uncertainty by measuring the variation of these expectations over time using data on inflation expectations from financial markets. Higher volatility in financial market expectations is interpreted as higher uncertainty. This approach has several advantages: First, it is simple and fast, and it can be applied to all available time series on inflation expectations without requiring further information. This implies, for example, that inflation uncertainty can be captured for the various maturities available from inflation-linked financial instruments. Furthermore, the availability of time series-based inflation expectations data across different groups of agents allows comparisons across these groups. The disadvantage of this approach is that it hinges on a number of crucial assumptions. For one, using the volatility of inflation expectations derived from inflation-linked financial instruments assumes that volatility in financial market prices depends at least largely on changes in perceived inflation uncertainty – where in fact they may also be caused e.g. by various forms of market inefficiencies, even more so during financial market crises. More importantly, however, this approach assumes that higher uncertainty translates into higher variation over time, which need not necessarily be the case.

Finally, when information about perceptions is available for individuals or across agents, a pure time-series approach that uses only the variation in the mean of the aggregate over time clearly neglects important and relevant information.¹¹

2.2 Not All Concepts Are Covered Equally by Available Data

Ideally, it would be desirable to capture uncertainty about future inflation for all major groups of economic agents or sectors, i.e. consumers, trade unions, businesses, financial markets and professional forecasters, based on the uncertainty perceived by each individual. In practice, the available data are far more limited. In the euro area, the measurement of uncertainty about inflation expectations can draw on three sources of data: (1) consumer data from the European Commission's Business and Consumer Survey, (2) the ECB Survey of Professional Forecasters and (3) data from inflation-indexed financial instruments. The data sets and instruments used in these three sources are described and discussed extensively in Gnan et al. (2009). The focus here is on determining which of the three concepts for measuring uncertainty outlined in subsection 2.1 can be captured by each data source.

As illustrated in table 1, the ECB SPF allows us to use all three approaches. The European Commission's BCS includes data on inter-individual differences in expectations and time series information. Uncertainty measures based on index-linked financial market instruments are limited to the third approach, namely that of measuring volatility over time.

¹¹ For a detailed evaluation of various measures of inflation forecast uncertainty, see Giordani and Söderlind (2003). They find that time series models capture uncertainty rather poorly compared to survey data on individual uncertainty or differences in expectations.

Table 1

Measuring Uncertainty about Future Inflation: Evaluating the Data Sources

	Individual uncertainty	Inter-Individual differences	Variation over time
ECB Survey of Professional Forecasters (SPF)	yes	yes	yes
European Commission's Business and Consumer Survey (BCS)	no	yes	yes
Index-linked financial instruments	no	no	yes

Source: OeNB.

3 Stylized Facts on Uncertainty about Future Inflation in the Euro Area

Before embarking on an econometric analysis of the possible driving forces behind the evolution of uncertainty about future inflation, it would be useful to explore how ex-ante and ex-post uncertainty has developed over the past few years, in particular during the succession of shocks since 2007. This section analyzes the evolution of inflation

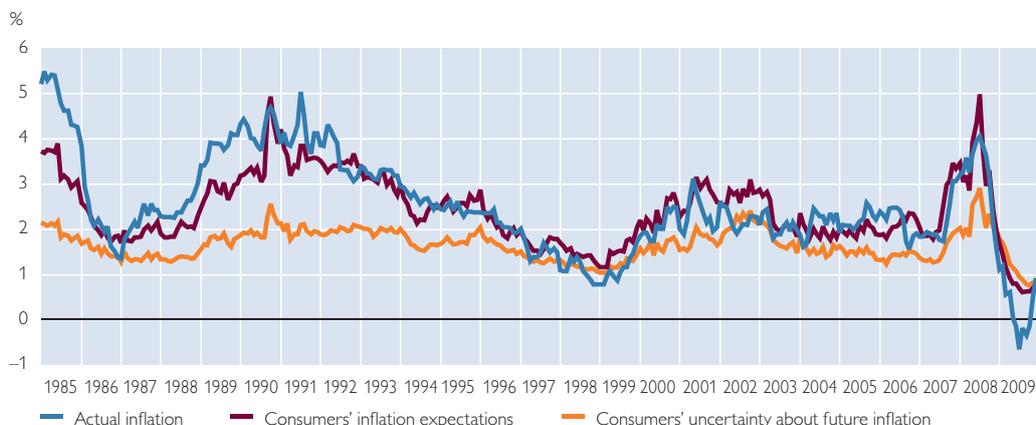
expectations and the associated uncertainty among consumers, professional forecasters and financial markets over time.

3.1 Consumers' Uncertainty about Future Inflation Reached an All-Time High During the Crisis

Chart 4 shows the evolution of actual inflation as well as consumer expectations and uncertainty about future inflation based on data from the European Commission's BCS. The graph shows that there is a high correlation between inflation and uncertainty about its future development in the case of consumers (0.72 for the period from 1985 to 2009). It is also clear that the series is rather stable and did not follow inflation in the high inflation periods of the mid-1980s and early 1990s. Given this history, the reaction of uncertainty to the surge in inflation since 2007 is quite surprising. Indeed, uncertainty rose to an all-time high in mid-2008. What is even more striking is the subsequent rapid decline and the very low level of uncertainty observed toward the end of 2009.

Chart 4

Consumers' Inflation Expectations and Uncertainty



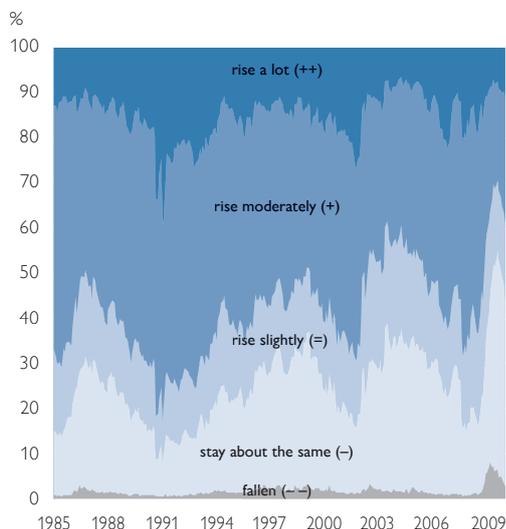
Source: OeNB, European Commission's BCS.

Note: Inflation expectations are defined as inflation expected by euro area consumers for the coming 12 months. Uncertainty about future inflation is derived from the standard deviation of the probability distribution of inflation expectations (for further details, see Arnold and Lemmen (2006) and subsection 2.1., approach (b)).

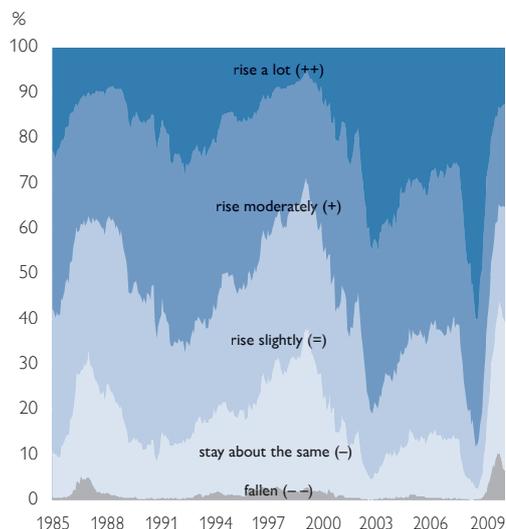
Chart 5

Distribution of Euro Area Consumers' Inflation Expectations and Perceptions

Expected inflation¹



Perceived inflation²



Source: OeNB, European Commission's BCS.

¹ Survey question: "By comparison with the past 12 months, how do you expect that consumer prices will develop in the next 12 months?"

² Survey question: "How do you think that consumer prices have developed over the last 12 months?"

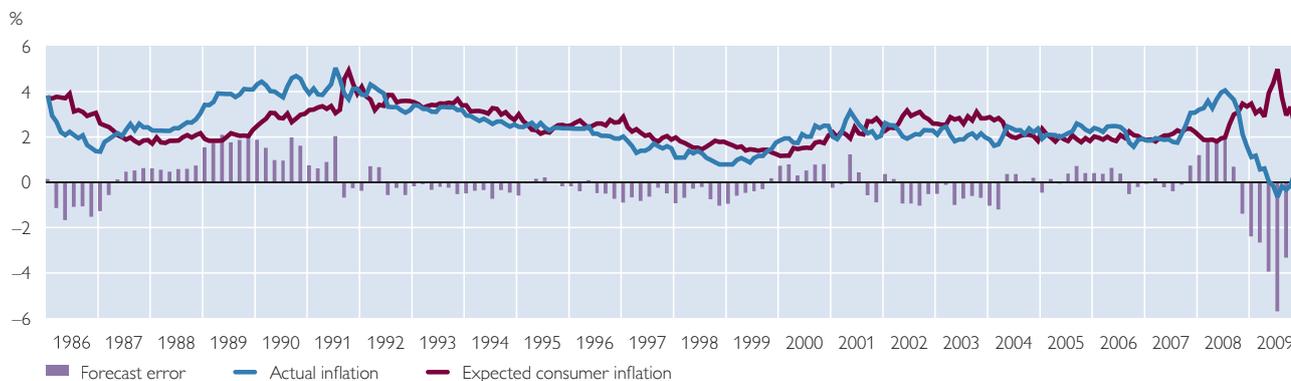
Note: The share of "don't know" responses is not considered. Survey data including January 2010.

At this juncture, it is worth taking a closer look at the distribution of euro area consumers' inflation expectations. Chart 5 shows that – after fairly stable response behavior since the start of the series in 1985 – recent months have witnessed record lows in the share of consumers who expected large (De-

cember 2009: 9.8%) or moderate price rises (26.7%) over the coming 12 months. At the same time, the share of consumers who expected prices to stagnate (44.4%) or fall (3.4%) jumped to unprecedented levels. Most recently, we have observed a certain reversal in this development.

Chart 6

Euro Area Consumers' Forecast Error



Source: OeNB, European Commission's BCS.

Note: Expected inflation is defined as the rate of inflation expected by European consumers for the coming 12 months one year ago. The forecast error is measured as the difference between actual and expected consumer inflation.

3.2 Recent Sharp Inflation Swings Have Caused Large Expectation Errors among Consumers

It is also interesting to consider how the sharp increase in inflation volatility affected consumers' ability to anticipate inflation correctly (unanticipated inflation is generally considered more harmful and costly than anticipated inflation). Chart 6 reveals that ex-post inflation uncertainty, as measured by consumers' expectation errors, has also been exceptionally high since 2008. In the first half of 2008, unanticipated inflation reached levels previously seen two decades earlier, and the ensuing surprise disinflation was unprecedented over the past quarter of a century. Expectation errors peaked in mid-2009 and have been receding since then.

3.3 Recent Sharp Inflation Swings Have Increased Uncertainty among Professional Forecasters

How did professional forecasters cope with the end of the "Great Moderation" in their inflation forecasts? Compared to the European Commission's BCS data, the database from the ECB's SPF allows us to investigate this question more thoroughly in three respects: First, the database provides quantitative inflation forecasts. Second, the forecasts are available for three time horizons (one, two and five years). Finally, the SPF documents individual probability distributions as provided by the respondents, thus revealing the evolution of both individual and aggregate uncertainty.

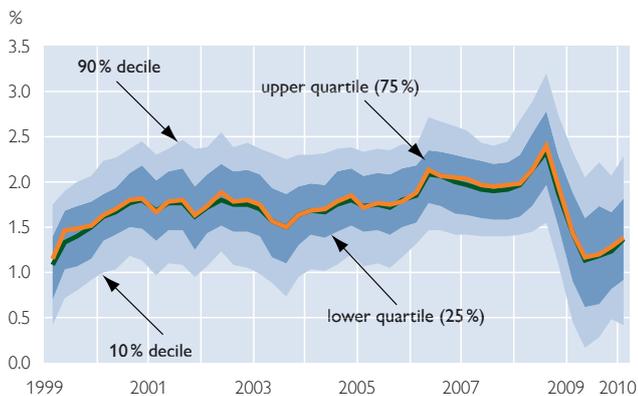
Chart 7 (left panels) shows that professional forecasters reacted to the economic shocks and the resulting sharp

swings in headline inflation with an initial upward and then a sharp downward revision of inflation forecasts. This response was more accentuated in short-term forecasts (one and two years) than for the five-year time horizon.

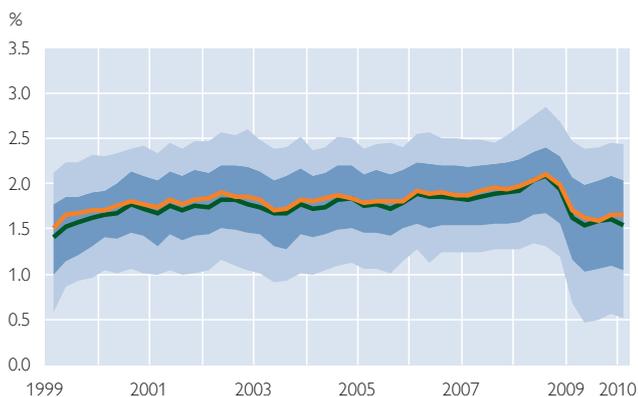
Individual uncertainty about future inflation (as captured by the average standard deviation of individual forecasters' probability distributions; see chart 7, right panels) had not exhibited any noteworthy changes since the start of EMU. It reacted only slightly to the oil and commodity price shock, possibly reflecting the well-understood nature of a supply shock and the high anti-inflationary credibility of the Eurosystem. However, individual uncertainty rose to unprecedented levels across all forecasting horizons in response to the financial and economic crisis, reflecting the size and unprecedented nature of the crisis and its consequences. Interestingly, the increase in uncertainty affected the two- and five-year forecasting horizons more than the one-year horizon, a fact which may be attributed to uncertainty about the duration of the recession, the speed and strength of recovery, and the time profile of the output gap over the next few years. For the five-year horizon, forecasting uncertainty initially reacted to the crisis more sluggishly than for the shorter-term forecasts, but then rose particularly sharply in the first quarter of 2010. As also evidenced by the corresponding panel in chart 7 (lower left), the probability distribution of five-year inflation expectations broadened until the first quarter of 2010, with "extreme" medium-term scenarios being regarded as less unlikely over time.

HICP Inflation Forecast: Aggregated Probability Distribution

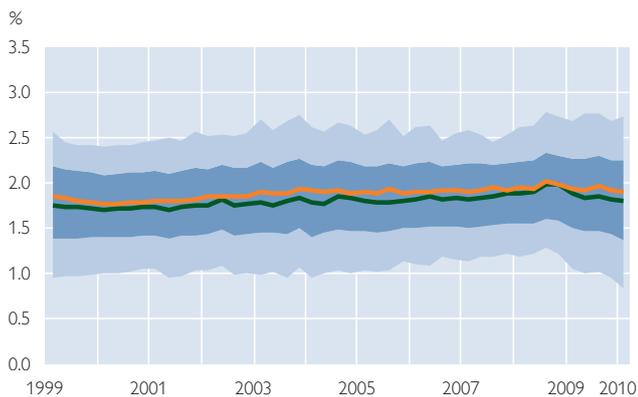
1 year ahead



2 years ahead



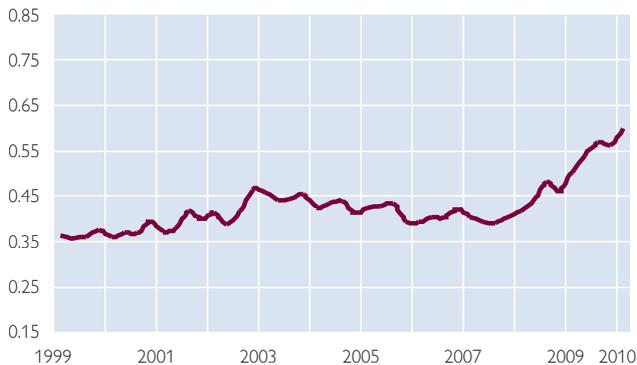
5 years ahead



— Mean — Median — Individual uncertainty

HICP Inflation Forecast: Individual Uncertainty

Standard deviation



Standard deviation



Standard deviation

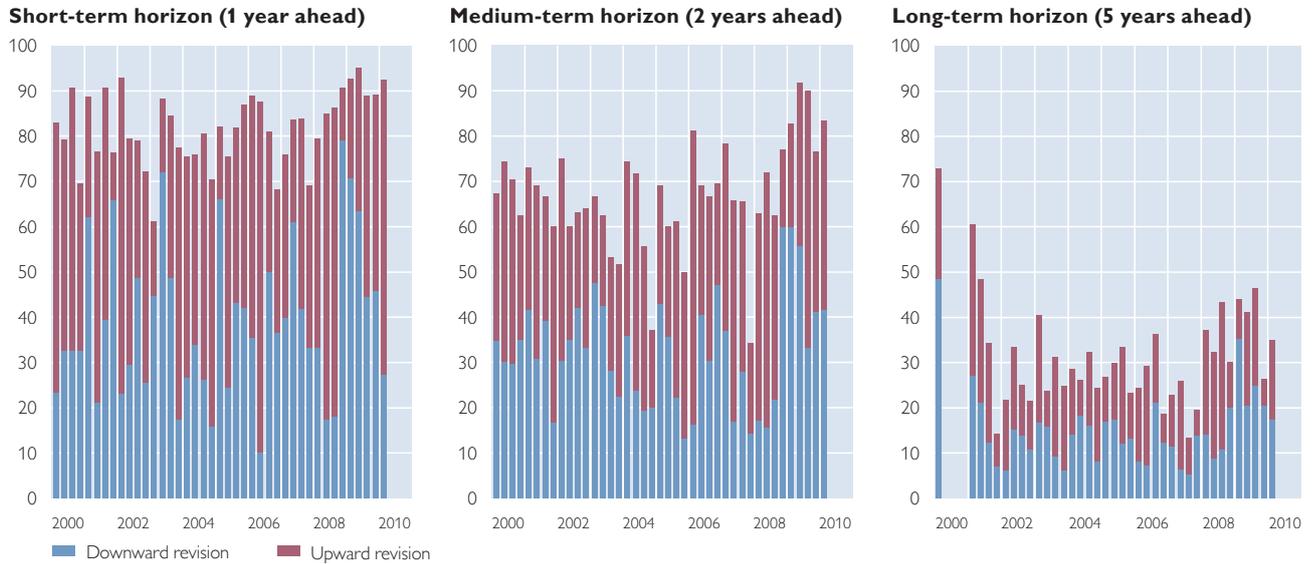


Source: OeNB, ECB's SPF.

Note: Individual uncertainty refers to the average standard deviation of individual respondents' probability distributions. SPF 1-year and 2-year ahead forecasts with rolling horizons.

HICP Inflation Forecast Revisions

Percentage of participants who provided a reply in two consecutive periods



Source: OeNB, ECB's SPF.

Note: SPF 1-year and 2-year forecasts with rolling horizons.

A breakdown of SPF forecast revisions into upward and downward revisions reveals the professional forecasters' struggles to cope with the unexpected succession of upward and downward shocks to inflation (chart 8). Until the third quarter of 2008, upward revisions dominated, reflecting the effects of the supply-push price shock. From the fourth quarter of 2008, the picture changed dramatically and downward revisions clearly prevailed. However, by the third quarter of 2009, a balance of upward and downward revisions was reached, reflecting inter alia the general perception of a recovery gaining ground. By the first quarter of 2010, the percentage of overall forecast revisions had not yet fully returned to normal levels, indicating persistent uncertainty generated by

the crisis and its short- to medium-term fallout.

3.4 Financial Markets' Inflation Expectations Reacted Sharply During the Crisis and Have Not Yet Fully Normalized

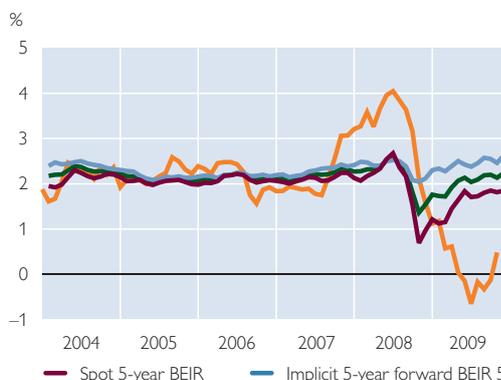
As mentioned before, using financial market-based indicators to measure market expectations on inflation is fraught with methodological difficulties during times of financial distress, since market prices may be distorted by a number of special factors.¹² This applies even more to measures of uncertainty about future inflation based on financial price volatility.

With these caveats in mind, the general picture which emerges from chart 9 is that the volatility of inflation expectations on financial markets was

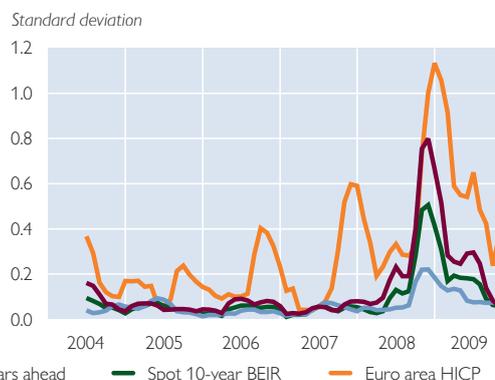
¹² The markets for index-linked government bonds are generally smaller and less liquid than those for non-indexed bonds. For discussions of the various limitations involved in deriving inflation expectations from financial market indicators, see e.g. Gnan et al. (2009), Hördahl (2009) and Ejsing et al. (2007).

Financial Market Instruments: Inflation-Linked Bonds

Selected Break-Even Inflation Rates



Volatility



Source: OeNB, ECB.

Note: Spot rates are plotted as five-day moving averages adjusted monthly. Furthermore, we assume constant maturities and seasonal adjustment; see Ejsing et al. (2007). Volatility is measured as the standard deviation over the past six months.

very small up until mid-2008. However, it skyrocketed around the turn of the year 2008/2009 as a result of high volatility in headline inflation itself and a sharp increase in uncertainty about the economic outlook. Reflecting the development in *break-even inflation rates*

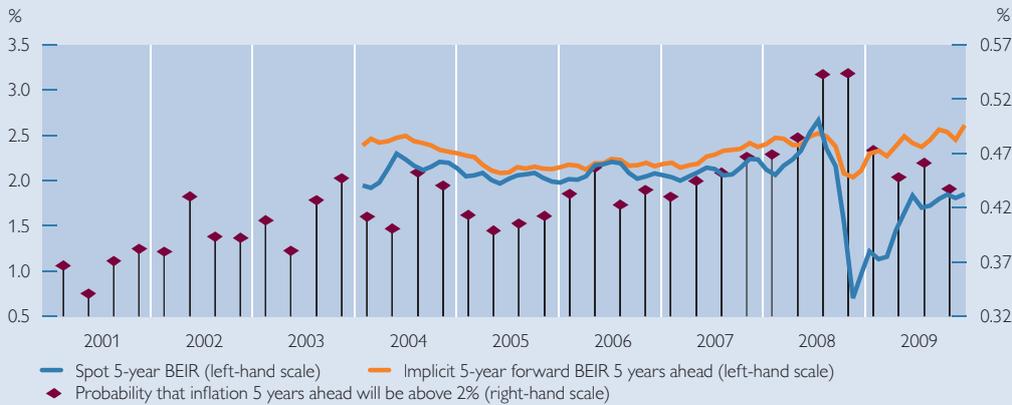
(BEIRs), volatility rose far more significantly for longer horizons than for short ones. Although it clearly declined thereafter, it had not fully returned to its previous “normal” levels by end-2009.

Fears of High Inflation versus Deflation – What Do Various Indicators Tell Us?

One important question for monetary policy is whether high uncertainty might trigger an unanchoring of inflation expectations either to the upside or to the downside. This box addresses two issues: First, were medium- to long-term inflation expectations destabilized upward as a result of the cost-push shock in late 2007 and early 2008? Second, how serious were deflation concerns in late 2008 and 2009?

Regarding the first question, data on comparable medium-term inflation expectations are available only for professional forecasters and financial markets. The chart below suggests that between mid-2007 and mid-2008, both financial markets and professional forecasters became increasingly concerned that inflation would exceed the Eurosystem’s definition of price stability over the medium term. However, financial markets were quicker to reverse their assessment in the second half of 2008, particularly as the crisis escalated from the third quarter onward. Professional forecasters’ medium-term inflation concerns took roughly two quarters longer to recede. Note, however, that the probability attached to inflation exceeding the Eurosystem’s definition of price stability in five years remained fairly high at around 45% until the fourth quarter of 2009.

Inflation Concerns after the Energy and Commodity Price Shock



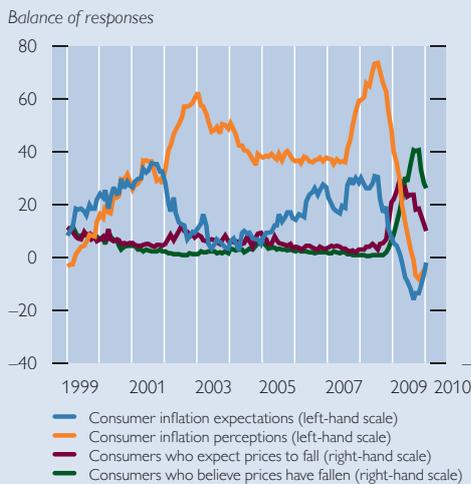
Source: OeNB, ECB.

Note: Spot rates are plotted as five-day moving averages adjusted monthly. Furthermore, we assume constant maturities and seasonal adjustment; see Ejsing et al. (2007).

As for the second question, the deflation expectations of both professional forecasters and consumers rose sharply from the third quarter of 2008 (see chart “Deflation Expectations among Consumers and Professional Forecasters” below). For the one-year horizon – the only one for which data are available for both groups – the share of consumers expecting prices to fall over the coming 12 months rose from virtually zero to nearly 7.4% by March 2009, then leveled off to 2½% in January 2010.¹ Similarly, professional forecasters sharply increased their predictions of negative inflation one year ahead from the fourth quarter of 2008, with this probability reaching a peak of 6.3% in the second quarter of 2009 and receding thereafter. Thus the assessment appears to have been consistent between these two groups of agents. The fact that the probability of deflation in two and five years’ time as estimated by professional forecasters was considerably lower than for the one-year horizon reflects the notion – apparently held by most forecasters – that the crisis and the accompanying phenomenon of deflation will be overcome in the not too distant future. However, it is also worth noting that professional forecasters’ five-year deflation expectations continued to increase up until the first quarter of 2010 (1.4%).

Deflation Expectations among Consumers and Professional Forecasters

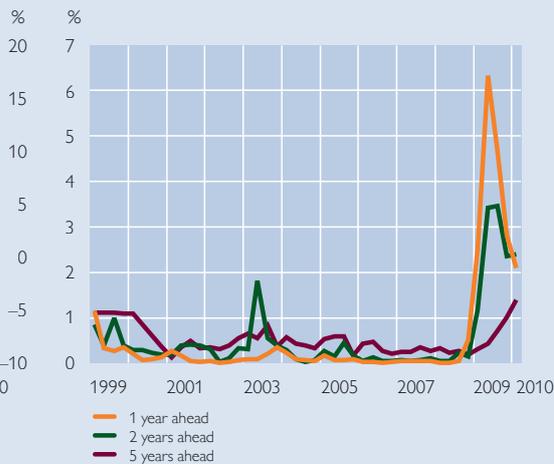
Consumers’ Inflation Expectations



Source: OeNB, European Commission, ECB.

Note: SPF 1-year and 2-year ahead forecasts with rolling horizons.

SPF: Probability of Negative Inflation



¹ The fact that backward-looking deflation perceptions (which refer to price developments over the previous 12 months) lagged behind deflation expectations and increased more drastically and for a longer time than deflation expectations suggests that consumers’ price expectations are by no means simply backward-looking: Consumers apparently use information in addition to, or different from, past price developments to form their assessments of future price developments.

4 Econometric Evidence Points to Heuristics Influencing Inflation Expectations Uncertainty

Section 1 outlined a number of possible strands of economic theory – neoclassical and behavioral – which might be relevant to understanding which factors may influence uncertainty about future inflation. Section 3 showed that inflation expectations and inflation uncertainty reacted rather moderately to the supply shock of 2007, but rather dramatically to the economic and financial crisis from 2008 onward. In the last few months of 2009, however, uncertainty about future inflation dropped sharply but did not return to pre-crisis levels. Although many theories may be relevant and interesting in explaining the development of uncertainty about future inflation, in this section we confine ourselves to elucidating the possible relevance of some heuristics suggested by behavioral economics and models assuming limitations on full rationality. Given that our estimates cover (only) the EMU period (with no obvious change of monetary regime to be expected), we do not consider other elements that could influence uncertainty over time, such as credibility or the role of central bank communication.

In particular, empirical estimates for the euro area are used to verify the following hypotheses: (1) Uncertainty about future inflation rises with the level of inflation; (2) uncertainty is influenced by the business cycle (i.e. the output gap) and by monetary policy (i.e. by the level of short-term interest rates); and (3) unexpected shocks to the economy have asymmetric effects on uncertainty because of psychological factors (overconfidence, availability

heuristic, salience heuristic, etc.) and/or limitations to full rationality (rational inattention, etc.).

The results presented here are a summary of certain findings from a more technical companion paper to this study (Gnan et al., 2010), which also documents in detail the estimation methods used and the robustness checks performed.

4.1 What We Test, and How

We investigate the reaction of agents' uncertainty about future inflation to various economic variables (fundamentals) compared to their reaction to unexpected shocks affecting the same variables (approximated by the latter's estimation residuals). The data sets used span the period from 1999 to 2009; thus, the estimations do not specifically concentrate on the recent economic and financial crisis but cover the full period since the inception of EMU, which includes a full business cycle and at least one financial crisis. The advantage of concentrating on the period when monetary union was already in place is that it isolates our discussion from the possible additional influence that a changing monetary policy regime and central bank credibility may have had on uncertainty.¹³

We use two alternative measures of uncertainty about future inflation, derived from the European Commission's BCS on the one hand and from the ECB's SPF on the other. In the former case, uncertainty is measured as the standard deviation of consumer responses at a given point in time, assuming normality in the responses, and in the latter case it is measured as the individual uncertainty reported by professional forecasters (both measures are

¹³ We explore this issue further in Gnan et al. (2010).

described in detail in section 2). Comparing these two groups of agents allows us to explore the differences between supposedly “rational” agents (professional forecasters) and perhaps “irrational” or “inattentive” agents (consumers).

Furthermore, we consider inflation expectations for two different time horizons in the case of professional forecasters. A one-year horizon is used to facilitate comparisons with uncertainty in consumer expectations; in addition, a two-year horizon is used to gauge the extent to which professional forecasters’ inflation expectations are formed differently for the very short-term horizon of one year as opposed to a medium-term horizon of two years. As argued in Gnan et al. (2009), a two-year time horizon should generally be regarded as more relevant from a monetary policy perspective, since this is the time horizon needed for monetary policy to show effects on inflation.

Specifically, we investigate whether and how the level of inflation, the real-time output gap,¹⁴ the level of short-term interest rates, and unexpected shocks to these variables drive uncertainty about future inflation.

As regards the effect of inflation levels on uncertainty, the standard view in the economic literature (Friedmann, 1977; Ball, 1992) is that higher inflation implies higher uncertainty about future inflation. By contrast, theories such as rational inattention, near-rational expectations or costly information acquisition would predict the opposite effect in the presence of unexpected news, because the potential gains from

redoubling efforts to process information tend to increase with higher inflation. Given these competing theories, we conjecture that inflation shocks may have asymmetric effects on uncertainty.

As for the effect of the business cycle on uncertainty, we would expect people to feel more confident (or overconfident) about their own inflation forecasting abilities in good times, meaning that perceived uncertainty should decrease. In recessions, which are often associated with negative supply shocks, when the central bank faces a policy dilemma between stabilizing inflation and output, uncertainty about the future in general increases. We would therefore expect the output gap to have a negative impact on uncertainty: A positive output gap should cause it to decrease, while a recession (negative output gap) would prompt an increase. In the same vein, a positive shock to the output gap is hypothesized to reduce uncertainty, and a negative shock to increase uncertainty.

Finally, the interest rate (as the instrument of monetary policy) is interpreted as a signal of the future direction of inflation and should therefore influence uncertainty. We hypothesize that an increase in interest rates, be it expected or not, signals tight monetary policy and thus lowers uncertainty about future inflation rates, whereas a more accommodative monetary policy is hypothesized to increase uncertainty. Thus, we would expect the interest rate (or shocks to the interest rate) to have a negative effect on uncertainty.¹⁵

¹⁴ We use a “quasi real-time” measure of the output gap. For more details, see Gnan et al. (2010).

¹⁵ In the current situation, for example, lower interest rates may have helped stabilize inflation expectations and reduce uncertainty about future inflation, because the lower interest rate signals that the ECB is doing everything in its power to avoid deflation. However, agents who recall episodes of high inflation might believe that lower interest rates in the short run could create a risk of inflation in the long run.

4.2 Lower Uncertainty in Response to Shocks Points to Salience Heuristics

Chart 10 shows the estimated effects of various variables and of the corresponding shocks on uncertainty about future inflation among consumers (over the coming 12 months) and professional forecasters (one and two years ahead).

As first result, we note that a higher level of inflation increases uncertainty about future inflation. This result holds for both consumers and professional forecasters and, in the latter case, for both the one- and two-year time horizons. This finding can be seen to confirm the standard mainstream neoclassical prediction that higher inflation increases uncertainty. The fact that the effect is stronger for the one-year horizon than for the two-year horizon may be interpreted as confirmation of the Eurosystem's credibility in ensuring price stability over the medium term: Higher current inflation is seen as creating uncertainty mostly over a period of one year, but much less so over two years, as price level effects will have faded and monetary policymakers will have taken any necessary countermeasures.

At the same time, shocks to inflation decrease uncertainty about future inflation both among consumers and professional forecasters (for the one-year horizon). This appears to confirm the prediction made by behavioral economists, namely that unexpected information about inflation will increase awareness and thus also the efforts undertaken to cope with and forecast inflation, which will in turn reduce uncertainty.

The output gap as such has neither large nor significant effects on uncertainty among consumers and professional forecasters.

However, unexpected shocks to the output gap generally have far larger dampening effects on uncertainty about future inflation, with a particularly large and significant effect emerging on the SPF two-year horizon. The stronger effect for this horizon may reflect the notion that the transmission of changes in the output gap to inflation takes a few quarters to show its full effect. Furthermore, the sharp reduction of professional forecasters' uncertainty in response to output gap shocks suggests that those forecasters react to positive news about the business cycle with a strong decline in inflation forecast uncertainty (and vice versa for negative news about the business cycle), which may reflect the influence of salience heuristics.

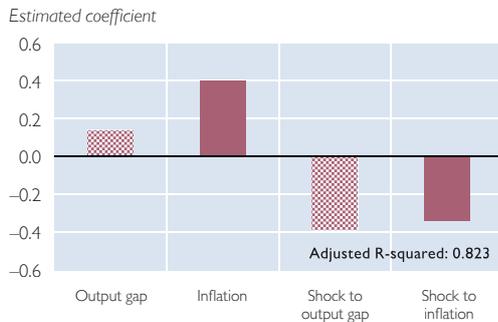
There is a vast difference between consumers and professional forecasters when it comes to the effect of the short-term interest rate on uncertainty. While this effect is significant and shows the expected (negative) sign in the case of professional forecasters, it is not significant for consumers. This difference may indicate that professional forecasters are more sophisticated in the sense that they follow monetary policy more closely, are more aware of the effects of interest rates on future inflation, and thus take the level of the short-term interest rate into account when forming expectations about future inflation. The negative sign of the coefficient implies that a higher interest rate level is associated with lower uncertainty about future inflation among professional forecasters on the one- and two-year horizons.

It is interesting to note that for the one-year horizon, professional forecasters' uncertainty rises with unexpected shocks to the short-term interest rate. In other words, surprise interest rate hikes by the central bank augment fore-

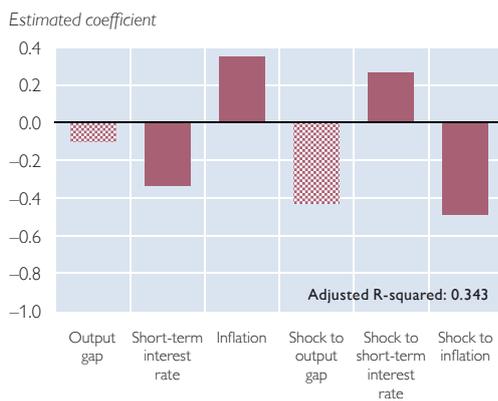
Chart 10

Effects on Inflation Expectations Uncertainty

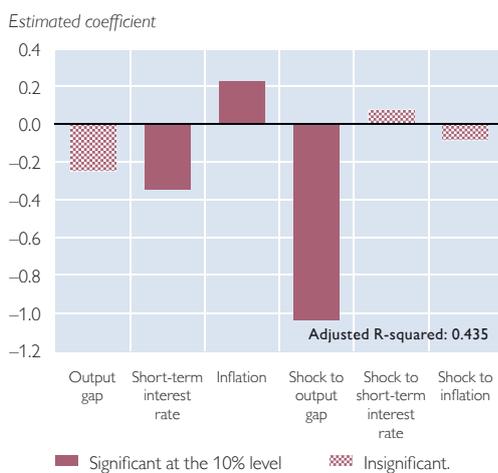
Consumer Expectations 1 Year Ahead (BCS)



Professional Forecasters' Expectations 1 Year Ahead (SPF)



Professional Forecasters' Expectations 2 Years Ahead (SPF)



Source: OeNB.

Note: SPF 1-year and 2-year ahead forecasts with rolling horizons.

casters' uncertainty about short-term developments, possibly because such surprise hikes may be perceived as conveying the notion of "hastened" central bank measures to cope with inflation. However, the fact that no significant effect is found for the two-year forecast horizon may again suggest that even in the event of unexpected interest rate moves, the Eurosystem does not face a credibility problem with respect to its medium-term price stability commitment.

4.3 Consumers and Professional Forecasters React Differently to Large Shocks

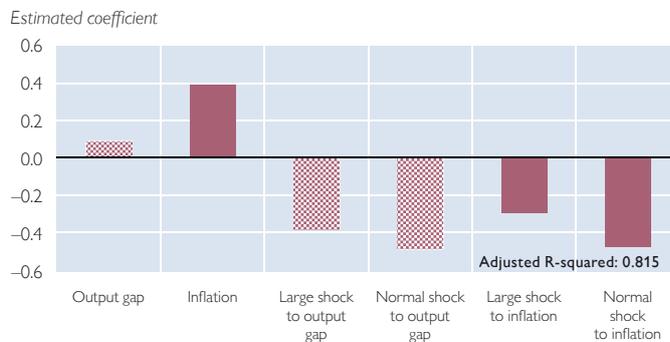
We have established that unexpected shocks to inflation and (in part) to the output gap appear to decrease uncertainty about future inflation, which may be due to salience heuristics. But does this apply to any type of shock, irrespective of its size? For instance, one could imagine that if shocks became very large, people might stop making additional efforts to acquire information. Instead, more people would employ heuristics such as representativeness, confirmation bias or overconfidence, which would discourage them from seeking information.

Alternatively, the additional information obtained might not reduce the level of perceived uncertainty in order to compensate for the increase in general economic uncertainty accompanying a large shock. In this case, larger shocks would yield a smaller reduction in uncertainty than small or normal shocks.

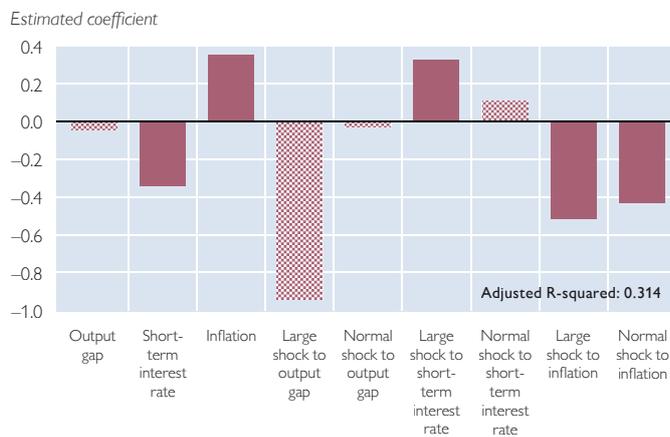
Chart 11 provides a breakdown of shocks by relative size. We find that among consumers, larger unexpected shocks to the output gap and to inflation do reduce uncertainty less than normal-sized shocks. By contrast, among professional forecasters, large

Effects on Inflation Uncertainty According to Size of Shocks

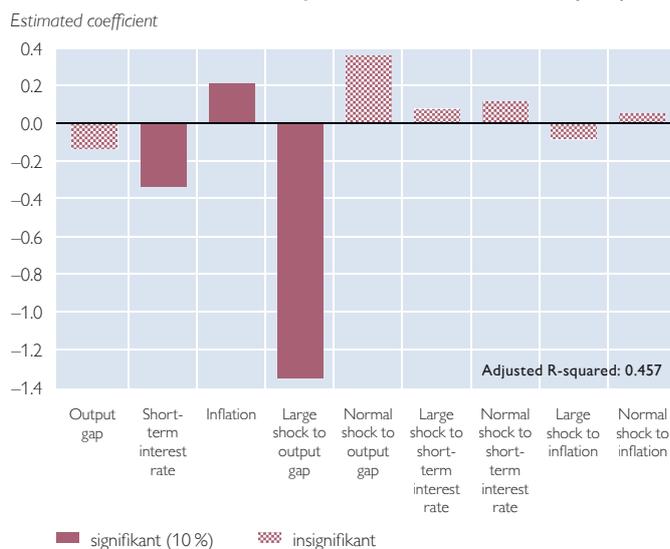
Consumer Expectations 1 Year Ahead (BCS)



Professional Forecasters' Expectations 1 Year Ahead (SPF)



Professional Forecasters' Expectations 2 Years Ahead (SPF)



Source: OeNB.

Note: SPF 1-year and 2-year ahead forecasts with rolling horizons.

unexpected shocks to both the output gap and inflation have larger dampening effects on uncertainty than normal-sized shocks. The previous result that interest rate shocks increase forecasters' uncertainty about future inflation for the one-year horizon is now confined to large interest rate shocks.

These results point to interesting behavioral differences between consumers and professional forecasters with regard to uncertainty about future inflation. Among consumers, some of the effects from uncertainty-reducing heuristics do seem to be countered by uncertainty-increasing behavior in the case of very large shocks. No such reversals in behavior appear to be at work among professional forecasters. Moreover, except in the case of inflation shocks, inflation forecast uncertainty among professional forecasters tends to react significantly only in the case of large shocks.

5 Conclusions

This study investigates the factors which drive uncertainty about future inflation over time and among different agents. The past three years have been marked by sharp fluctuations in inflation, reflecting the supply shocks in 1997 and the financial and economic crisis from 2008 onward. While short-term inflation expectations reacted quite strongly to headline inflation across consumers, professional forecasters and financial markets, the effect was far more muted for longer horizons (five years and beyond). Uncertainty about future inflation rose only moderately in response to the commodity and energy price shock in 2007, but the financial and economic crisis led to a dramatic increase across all types of agents, a fact which was also reflected in historically large forecast errors. During the final months of 2009, both

inflation expectations and uncertainty receded, but neither returned to pre-crisis levels. Despite a significant increase for short horizons (one or two years), the prospect of deflation was still regarded as very unlikely (clearly below 10%) among consumers and professional forecasters, which may be seen as a sign of public trust in the authorities' ability to steer clear of long-lasting economic contraction and deflation.

Our study shows that various strands of economic theory offer possible explanations for the mechanisms behind the formation of inflation expectations and its related uncertainty. These theories range from refined versions of rational expectations to behavioral economics. All these approaches assume less than complete information processing in agents' decisions, be it due to a lack of ability or effort. While they all point to heterogeneity in inflation expectations, their implications for uncertainty about future inflation are ambiguous and depend on assumed behavior and specific circumstances. Identifying which of the many possible mechanisms may be at work in a given situation is a challenge which the economic literature has yet to resolve. We take a few cautious steps in this direction in an econometric exercise, the details of which are documented in a more technical companion paper (Gnan et al., 2010).

The results of our estimates suggest that non-rational expectations and behavioral heuristics may indeed influence consumers' uncertainty about future inflation.

- First, higher levels of inflation increase uncertainty about future inflation. This result applies both to consumers and professional forecasters, and to the latter's one- and two-year forecasting horizons. It is also robust to various alternative

- estimation specifications. This finding confirms the predictions of mainstream neoclassical economics.
- Second, shocks to inflation decrease uncertainty in the short run, both in the case of consumers and professional forecasters. This finding points to the use of heuristics such as salience, but it is also consistent with theories such as rational inattention, near-rational expectations and costly information acquisition.
 - Third, our findings overall seem to confirm a higher level of sophistication among professional forecasters. In contrast to consumers, professional forecasters do react to news about the business cycle and monetary policy, which indicates that they use a richer data set and a more sophisticated model of the economy when forming inflation expectations. This notion is also confirmed by the finding that uncertainty in professional forecasters' inflation forecasts for different horizons is influenced by different information sets. While inflation and (shocks to) the short-term interest rate affect uncertainty on the one-year horizon, uncertainty in two-year inflation expectations is mainly driven by unexpected shocks to the output gap.
 - Finally, consumers and professional forecasters react differently to very large shocks. We find that the uncertainty-reducing effect of inflation shocks among consumers is lower for large shocks than for small ones, which implies that while unexpected shocks seem to trigger an improvement in the way agents process information, there is a limit to how much such a shock can decrease uncertainty. By contrast, no such reversal in behavior appears to be at work in the case of professional forecasters. Moreover, except in the case of inflation shocks, inflation forecast uncertainty among professional forecasters tends to react significantly only in the case of large shocks.

This paper does not discuss other aspects of how expectations are formed, such as the role of credibility or type of policy regime which could potentially influence uncertainty. As we investigate uncertainty only in the euro area during the EMU period, it seems plausible to assume that there have been no changes in credibility. Given the importance of inflation expectations and uncertainty for monetary policy and for economic outcomes in general, more extensive research in this area would clearly be worthwhile.

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The Relationship between Competition and Inflation

Jürgen Janger,
Philipp Schmidt-Dengler¹

This study supplements previous empirical work on the relationship between the average rate of inflation and competition by adding a new approach for estimating markups and investigating the annual rate of inflation, price variance and price levels.

Subject to certain qualifications, markups can be interpreted as indicators for competition intensity. Our calculation, conducted for 15 countries and 34 sectors, exhibits major differences between the sectors within one country and among the same sectors across various countries. The markups are used to produce estimates of the relationship between competition and inflation (average and annual rates), price levels and price variance. Although a significantly negative correlation with inflation and price variance is evident for the period from 1991 to 2005, competition loses its explanatory power for inflation rates when longer time spans are considered.

In terms of economic policy, this study confirms the findings of previous works which identify the intensification of competition as a temporary means of curbing price increases. A new finding from this study is the evidence for the inflation-stabilizing effect of intensified competition, which is caused by its negative correlation with price variance. The fact that no significant relation between price level and competition intensity was found may be attributable to insufficient data.

JEL classification: L11, L16, E31

Keywords: competition, inflation, markup

This paper analyzes the supply-side triggers for inflation and continues a study conducted by Janger (2008) that attempted to obtain a current picture of competition intensity in Austria using highly disaggregated data. This study examines the general relationship between competition and inflation by analyzing international data on a less highly disaggregated level. Essentially, it is a non-technical version of an article authored by Janger and Schmidt-Dengler (2010).

Increases in final consumer prices can either be caused by cost-push inflation or market power inflation. Cost-push inflation occurs when rising costs of production factors (labor, raw materials, etc.) are passed on to consumers via consumer prices. Market power inflation occurs when enterprises exploit monopoly positions or a lack of market competition, or when they collude with

competitors to improve profit margins by raising prices (profit-push inflation). When compounded with cost-push effects, profit-push effects will precipitate wage-price spiral inflation: Inflation-induced wage hikes cause companies to raise prices, which in turn creates pressure for further wage increases. This study focuses on the possible influences exerted by market power inflation and competition intensity on price levels, annual and average inflation rates and price variance.

This study is organized as follows: Section 1 provides an overview of the literature on the topic of competition and inflation. Section 2 deals with the calculation of markups, which are subsequently used in section 3 to examine the connection between competition and inflation. Our conclusions are presented in section 4.

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Refereed by:
Michael Böheim,
Austrian Institute of
Economic Research

1 Findings from Previous Literature on Competition and Inflation

Previous studies approach the relationship between competition and inflation from two directions. The first approach examines the effect of rising inflation on companies' market power. Empirical analyses identify a positive relationship between inflation and price dispersion, thereby constraining the information that consumers obtain from current prices (e.g. Chirinko and Fazzari, 2000). The magnitude of this effect depends on the size of search and information costs incurred. If search costs are high, demand elasticity will be low (since switching to another supplier involves substantial costs), which allows companies to raise their markups in an environment of increasing prices. If, by contrast, search costs are low and demand elasticity is high, price hikes are more likely to lead to a reduction in market power (Gwin and Taylor, 2004).

The second approach examines whether different levels of competition intensity may be responsible for varying rates of inflation across economic sectors or countries. According to the theoretical arguments proposed by Kydland and Prescott (1977) and Barro and Gordon (1983), impaired competition reduces the significance of price stability in monetary policy. In his research, Cavelaars (2003) uses this theory as a point of departure for his analysis of the connection between competition and inflation. In Cavelaars' paper, the average markup acts as a proxy variable for competition intensity and provides a significant explanatory variable for the average inflation rate observed in 21 countries in the period from 1988 to 2000. The markup is measured as the

inverse of the wage share of GDP and thus does not account for capital costs. The results of Cavelaars' research are confirmed by Przybyla and Roma (2005) in their examination of 14 economic sectors and 8 EU countries over a longer time span (1980 to 2001).

This study adds to the literature by applying a markup that considers not only wages and capital costs but, in addition to average inflation, also examines the relation between competition and price levels, annual inflation and price variance.²

2 Markups as a Competition Indicator for Countries and Economic Sectors

2.1 The Calculation of Markups

A markup is defined as the difference between the marginal cost of an item and its selling price. The markup factor, μ , denotes the direct relationship between these values, while the Lerner index, B , measures the ratio of the difference between price and marginal costs to the price itself. In a perfect competition scenario, price P should equal marginal costs GK ; consequently, the ratio should be either 1 (μ) or 0 (B).

$$\mu = GK/P$$

or

$$B = P - GK/P$$

In practice, however, prices often considerably exceed marginal costs. The scale of divergence between price and marginal costs is an indicator of the deviation of reality from perfect competition or the extent of market power. Markups are used frequently in empirical investigations to identify competition problems and can be analyzed along the value-added chain to examine competi-

² Janger and Schmidt-Dengler (2010) also provide a theoretical derivation of these relationships.

tion intensity on the basis of cost pass-through. However, such analyses require a sufficient amount of available price data at every level, from international commodity markets to producer and wholesale prices to consumer prices. These data are usually robust enough only for products with a short value-added chain, i.e. products with a fairly limited processing or product change, such as food production and retailing.

Due to a lack of information on marginal costs, markups must be approximated. At the sectoral level, the ratio of gross value added to personnel expenditure is a suitable proxy, for example. However, this method is quite simple and includes many limitations. This study uses the more comprehensive method developed by Röger (1995) for estimating markups, which allows consideration of

labor, capital and other costs (e.g. energy, commodities and services).

Essentially, this method is based on calculating total factor productivity as a residual after deducting capital and labor contributions to growth from GDP growth in accordance with Solow (1957). Solow's method assumes perfect competition. Under conditions of imperfect competition, if markup B is not equal to 0, a different result is extrapolated for the residual (Hall, 1988). Röger (1995) demonstrates that under imperfect competition this productivity residual can be calculated from both the production and the dual cost functions. Therefore, the residual disappears when the cost function is subtracted from the production function and the markup can be calculated by using data on labor, capital and input costs. The

Calculation of Markups Following Röger's Methodology (1995)

This study estimates

$$\Delta y_{jt} = B_j \Delta x_{jt} + \varepsilon_{jt}$$

where

$$\begin{aligned} \Delta y_{jt} &= (\Delta q_{jt} + \Delta p_{jt}) - \alpha_{jt} (\Delta n_{jt} + \Delta w_{jt}) - \beta_{jt} (\Delta p_{mjt} + \Delta m_{jt}) \\ &\quad - (1 - \alpha_{jt} - \beta_{jt}) (\Delta k_{jt} + \Delta r_{jt}) \text{ and} \\ \Delta x_{jt} &= (\Delta q_{jt} + \Delta p_{jt}) - (\Delta k_{jt} + \Delta r_{jt}) \end{aligned}$$

in logarithmic form applying the least squares method. Index j represents the respective sector, q_{jt} denotes the real gross manufacturing output, p_{jt} is the corresponding price series, α is the share of total wages in the gross manufacturing output, n_{jt} represents labor performance, w_{jt} denotes hourly wages, β is the share of inputs in the gross manufacturing output, m_{jt} specifies input costs themselves (energy, materials and services), p_{mjt} indicates their prices, k_{jt} identifies real capital services and r_{jt} shows the user cost of capital. Other than the last item, all data are extracted from the EU KLEMS database (March 2008 release). The user cost of capital is estimated following the methodology adopted by Hall and Jorgenson (1967) using data from the European Commission's AMECO database:

$$r_t = P_t [(i - \pi_e + \delta)]$$

where P_t denotes the investment deflator, $i - \pi_e$ the real long-term interest rate and δ the economic depreciation rate, which is taken as 8% in keeping with other studies. As no sector-specific data are available, the user cost of capital can only be calculated at the national level, which has little bearing on our analysis since variation across the sectors should be minimal. For additional details on the calculation procedure, see e.g. Annex 7 in Koszerek et al. (2007) and Janger and Schmidt-Dengler (2010).

estimation equation is described in detail in the box below (Calculation of Markups Following Röger’s Methodology (1995)). The EU KLEMS dataset provides the required sectoral data for a relatively large longitudinal cross-section of countries (see Timmer et al., 2007, for a detailed description). This study calculates the markups for the observation periods from 1991 to 2005 and from 1980 to 1990 across 15 countries and 34 sectors. For methodological reasons, a markup that is constant over time has been assumed, i.e. price changes must be equal to changes in marginal costs.

2.2 Markups by Countries and Sectors

Charts 1 and 2 show a breakdown of markups by countries and industries. Table 2 in the appendix contains detailed descriptions of the respective sectors. The results are very similar to the calculations performed by Koszerek et al. (2007) and Christophoulou and Vermeulen (2008), who also use EU KLEMS data and Röger’s methodology.

Perfect competition or a markup B of 0 are largely rejected; the negative figures in a few industries are caused by prices falling short of marginal costs.

Chart 1

Variations in Markups between and within Countries (1991–2005)

Gap between price and marginal costs relative to price



Source: EU KLEMS database, OeNB.

Chart 2

Markup Levels by Sectors (1991–2005)

Gap between price and marginal costs relative to price

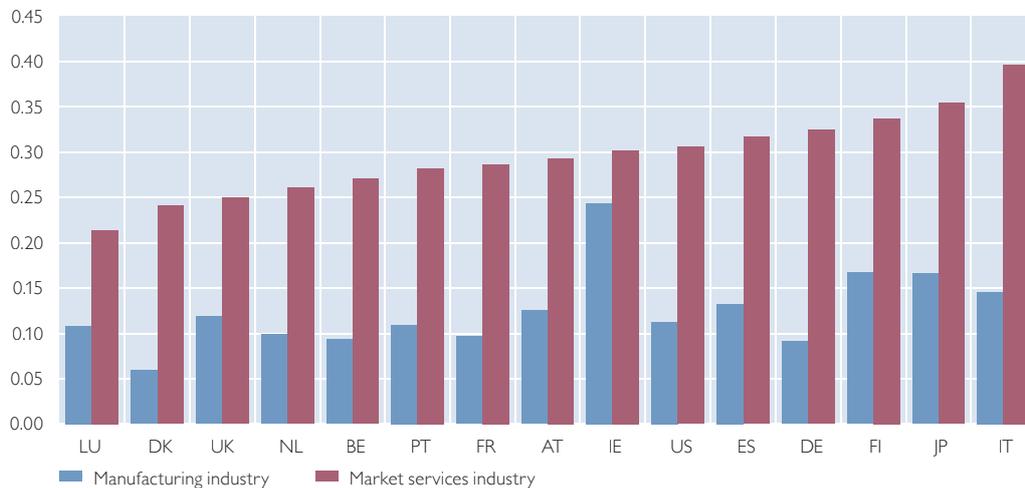


Source: EU KLEMS database, OeNB.

Chart 3

Comparison of Markups in the Manufacturing and Market Services Industries

Gap between price and marginal costs relative to price



Source: EU KLEMS database, OeNB.

Overall, differences at the country level are relatively minor, with Spain, Japan and Italy, whose competition intensity is generally regarded as low, exhibiting the highest markups. Within countries, however, major differences between individual industries can be observed, as is the case for the same industries in different countries. The manufacturing sector (sector D) exhibits considerably lower markups than does the market services industry (PRI_SE; services excluding public services). This difference may in part not only result from lower levels of competition intensity, but also from rising economies of scale. The relatively high results for the United States might be attributable to the large share of services in the national economy. Of note, Denmark, the United Kingdom and the Netherlands exhibit low markups for services. These three countries pursue an active policy to strengthen competition in the service sector through

strong competition authorities and proactive competition policy frameworks (e.g. Janger, 2008).³

Compared with the period from 1991 to 2005, the changes in markups seen between 1980 and 1990 are within reasonable limits (chart 4), which makes the assumption of a constant markup seem plausible.

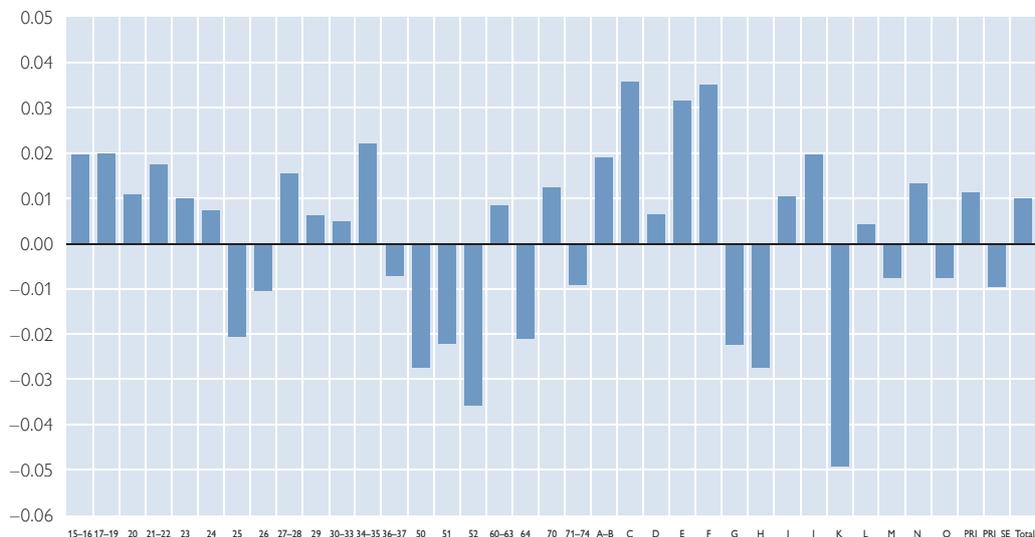
Markup developments must be interpreted with caution: partly because of methodological limitations and partly due to difficulties in interpreting markup levels.

Methodological limitations include the assumption of both a constant markup and constant economies of scale, as well as the possibility of measurement errors in the data required for calculation. Christopoulou and Vermeulen (2008) apply different methods to correct the bias generated by a constant markup, although markups calculated in this manner are scarcely different from con-

³ Competition intensity is also relevant aside from its connection with inflation: Empirical studies have shown significant interaction between competition and productivity (e.g. Nicoletti and Scarpetta, 2003; Aghion and Griffith, 2005).

Changes in Markups 1991–2005 vs. 1980–1990

Difference in percentage points



Source: OeNB.

stant markups. Increasing economies of scale would produce a downward bias of markups. An equal effect could also be caused by a number of measurement errors, while biases limited to the growth in the nominal gross manufacturing output and to nominal capital services would generate an upward bias. As data measurement errors are reduced, *a priori*, by using growth variables rather than levels in the calculation, the methodology utilized for this study appears to yield plausible results, particularly with regard to the lower limits for markup levels.

Are markups sufficient proxies for competition intensity? The literature frequently examines the correlation of markups with other competition indicators. Thus, a significantly positive correlation was found to occur between markups and the OECD's product market regulation indicators (Przybyla

and Roma, 2005)⁴, while a negative correlation was found with sectoral market entry rates, although not with concentration indicators (Oliveira Martins et al., 1996). Elevated markups can result from R&D efforts that justify temporary monopoly profits. Following the Röger method, Oliveira Martins et al. (1996) show that markups in R&D-intensive sectors are indeed higher. However, the considerable variation among markups in these sectors across all countries also points to other explanatory factors, such as competition intensity.⁵

Furthermore, this study examines the connection between markups and the Herfindahl index, a concentration ratio that originates from a database linked to the EU KLEMS database (O'Mahony et al., 2008), albeit for a limited number of sectors and years. As in Oliveira Martins et al. (1996), the

⁴ Markups calculated as inverse of the wage share of GDP.

⁵ Markups may also be low because the workforce, possessing a high level of market power, succeeds in securing a large proportion of the economic rents, or because the owners' profit push is weak. However, especially with regard to the period from 1991 to 2005, these effects should be minor since the wage share of GDP has gone down in most countries while owners' profit expectations tended to climb.

estimate does not yield a significant result. Yet this is hardly surprising since the relation between concentration and competition intensity is unclear. Rather, this relation also depends on demand elasticity (concentration only becomes problematic when there is little elasticity, i.e. when switching rates are low), a consideration for which no information is available that corresponds with the EU KLEMS dataset.

An additional estimate performed in this study reveals a significantly negative correlation (at a level of 1%) between a country's markup and the openness of its national economy and market size. A high degree of openness should strengthen competition intensity (import competition), while the size of a country's market impacts the number of suppliers from which consumers can choose and therefore influences demand elasticity.

The overall conclusion drawn from this study's discussion of markups relative to methodology and the quality of the markup as a proxy for competition is that markups should exhibit a relatively high, albeit imperfect correlation with the phenomenon of competition intensity and can therefore be regarded as a proxy for competition intensity. Consequently, markups are applied as explanatory variables in section 3.

3 Competition Intensity and Price Level, Inflation Rates and Price Variance

This study relates markups and competition intensity to three different, dependent variables: (1) price level, (2) annual and average inflation rates, and (3) price variance. The results are summarized

in table 1. For ease of interpretation, the estimate does not use the actual value, B , but the value $(1-B)$ denoted by $Comp$. As increasing markups reduce competition, the $Comp$ value allows results to be read directly along the lines of "stronger competition leads to lower/higher inflation," etc.

3.1 Competition Intensity and Price Level

To determine the impact of competition intensity on the price level, we estimated the following regression equation in logarithmic form:

$$\log P_{jt} = \alpha \log \hat{c}_{jt} + \beta \log \hat{Comp}_j + \eta_j + \eta_c + v_{jt}$$

where P_{jt} denotes the price level, \hat{Comp}_j indicates competition intensity, η_j and η_c represent country- and sector-specific dummy variables, while v_{jt} is an error term. The price level data do not stem from the EU KLEMS database but from the new GGDC Productivity Level Database (Inklaar and Timmer, 2008), which contains sectoral purchasing power parities for 1997. These are converted to comparative sectoral price levels using the annual average U.S. dollar exchange rate for 1997. Initially, the equation is estimated using control variables (subsection 3.2); then, these variables are replaced with dummy variables for countries and sectors.⁶ As table 1 shows, the relationship is not significant despite the theoretically expected strong correlation between price level and competition intensity. However, it is very likely that the estimate suffers from a lack of data, as results are only available for one year, the cost data from the EU KLEMS database cannot

⁶ Since data are only available for one year, there are insufficient degrees of freedom present to enable a simultaneous estimate of dummy and control variables. The effect of control variables in the estimate with dummy variables is evaluated by regressing the results for countries' dummy variables on the control variables. This reveals a significant effect of openness (negative) and GDP per capita (positive) that we would also expect in theory.

be used because they are available only in index form, and the calculated data on wage levels are doubtful. Thus, there is still no general empirical confirmation of the connection between price levels and competition intensity; any such connection has only been partially established in applied research, such as in studies that investigate the effects attributable to the liberalization of the telecommunications industries (OECD, 1997).

3.2 Competition Intensity and Inflation Rate

In the next step, the impact of competition intensity on inflation rates is estimated using the equation

$$\Delta \log P_{jt} = \alpha \Delta \log \hat{c}_{jt} + \beta \log \hat{Comp}_j + \gamma \Delta \log \hat{c}_{jt} \log \hat{Comp}_j + \eta_j + \eta_c + v_{jt}$$

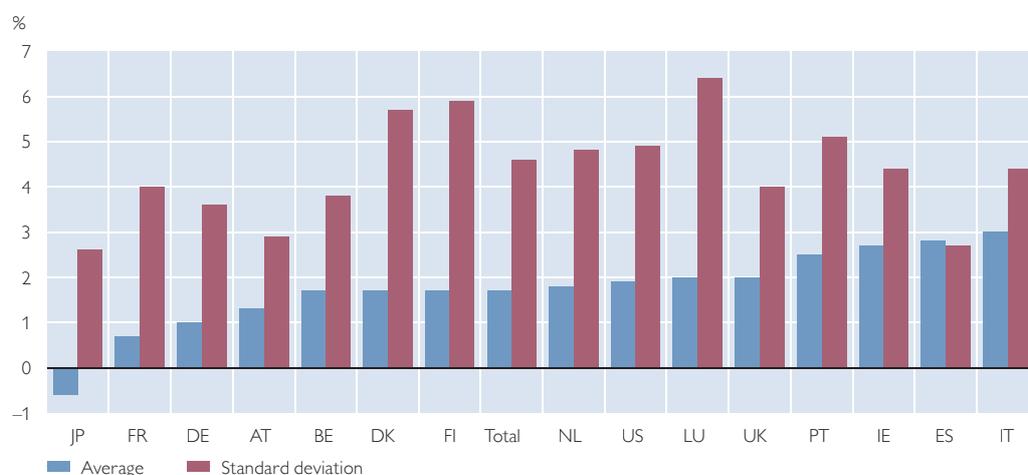
where ΔP_{jt} denotes the price change and $\Delta \hat{c}_{jt}$ the cost change. $\Delta \log \hat{c}_{jt} \log \hat{Comp}_j$ is an interaction term which, if significant, would indicate that the pass-through of costs to prices interacts with compe-

tition intensity (e.g. along the lines of “if competition intensity decreases, fewer costs are passed through to prices”). In this respect, inflation does not mean consumer price inflation, but instead derives from the price index series for the gross manufacturing output of each industry captured by the EU KLEMS dataset.⁷ Chart 5 depicts the inflation rates for each country, which average 1.7%. This rate is certainly plausible for the period from 1991 to 2005, during which the phenomenon known as “Great Moderation” was observed. A comparison of inflation rates with the markups in chart 1 shows a positive correlation (e.g. for Spain, Ireland and Italy). Japan is the exception, since its deflation was caused primarily by macroeconomic factors that stemmed from its year-long efforts to eliminate problematic financial assets from the balance sheet.

In addition to the variables outlined above, this study applies the following set of control variables, which are used routinely in empirical research on inflation (e.g. Neiss, 2001): *previous year’s*

Chart 5

Average Sector Inflation Rates and Standard Deviation



Source: EU KLEMS database, OeNB.

⁷ We use the *GO_P* variable in the EU KLEMS dataset, a price index series where 1995 = 100.

inflation as a measure of inflation persistence, *M3 growth*, the *output gap* as a measure of the business cycle, the degree of *openness* of a country's national economy, *per capita GDP* as a measure of institutional development, and *market size*. As these variables are only available at the country level, correlations of the error term might occur at this level; these are adjusted for by applying robust standard clustered errors. The above regression of inflation on competition intensity is estimated four times for annual and average inflation rates, once with and once without dummy variables in each case. The results are summarized in table 1.⁸

There is a significantly negative correlation between competition intensity and inflation in both models that use annual inflation rates and in the model that uses average rates and dummy variables (the specification preferred in this study since dummy variables also simplify the containment of data measurement errors). In the specification without dummy variables, the control variables *previous year's inflation*, *output gap*, *per capita GDP* and *M3 growth* have the theoretically expected signs and are statistically significant. The impact of the *openness* and *market size* variables is most likely already included in competition intensity (quality test of markups as competition indicators). In the regression using dummy variables, the only significant control variable is *previous year's inflation*. In this case, more than 80% of costs are passed through to prices. The interaction term is generally not significant.

The estimates are tested for robustness by correcting for extremes and checking for possible endogeneity in the

competition variable (competition impacts inflation, but, as noted previously, inflation may also have an influence on competition). Neither of the two corrections produces a change in the statistically significant correlation. In addition, estimating the equation using average inflation rates across the entire period from 1980 to 2005 reveals no significant relationship between competition and inflation during that time, which leads to the conclusion that the impact of competition on inflation is rather temporary.

The results for the observation period from 1991 to 2005 are significant in both econometric and economic terms. A twofold increase in competition intensity (i.e. cutting markups by half) would lead to a decline in inflation ranging between 0.14 and 0.17 percentage points, while perfect competition (markups equal to 0) would cause inflation to drop by 0.20 to 0.33 percentage points, depending on the model used.

3.3 Competition Intensity and Price Variance

To determine the impact of competition intensity on price variance, a Hodrick-Prescott filter is first applied to the price and cost series taken from the EU KLEMS database to adjust for cyclical effects. Using the noncyclical components,

$$\log sd(P_j) = \alpha \log \hat{sd}(c_{jt}) + \beta \log \hat{Comp}_j + \eta_j + \eta_c + v_{jt}$$

is estimated, where $sd(P_j)$ represents the standard deviation of prices and $\hat{sd}(c_{jt})$ the standard deviation of costs. Rising levels of competition intensity significantly reduce the standard devia-

⁸ In each case, the full effect of the competition variable is captured, i.e. the coefficient of the variable plus the relevant part of the interaction variable.

Table 1

Estimates of the Correlation between Competition and Inflation – Results

	Price level 1	Price level 2	Annual inflation 1	Annual inflation 2	Average inflation 1	Average inflation 2	Price variance 1	Price variance 2
Competition intensity (Comp)	0.0343 (-0.0475)	0.024 (-0.0622)	-0.00599* (-0.00306)	-0.01007*** (-0.00331)	-0.00529 (-0.00446)	-0.0091*** (-0.00336)	-0.00775** (-0.00494)	-0.02102*** (-0.00709)
Constant	-0.658*** (-0.162)		0.0155*** (-0.00351)		0.00876* (-0.00439)		0.00007 (-0.00662)	
Observations	344	344	5.031	5.031	389	389	389	389
Dummy variables		yes		yes		yes		yes
Control variables	yes		yes	yes	yes		yes	
R ²	0.139	0.609	0.710	0.725	0.712	0.826	0.780	0.883

Source: Authors' calculations.

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors in brackets.

Additional explanatory variables: Cost inflation/standard deviation of costs; interaction term of cost inflation/standard deviation of costs with competition.

Dummy variables: Countries and sectors; years in regressions with annual change.

Control variables: Previous year's inflation, degree of openness, output gap, per capita GDP, market size, M3.

tion of prices – a new finding that has not yet been reported in the empirical literature. The results are summarized in table 1.

4 Conclusions

This study aims to contribute to the empirical discussion of the correlation between competition intensity and inflation, price level and price variance – a topic that has recently received renewed interest, particularly following the inflation peak in 2008.

The calculation of markups *per se* reveals major differences in competition intensity. Irrespective of its connection to prices and inflation, competition intensity is an influential factor in productivity growth and thus in economic growth. Empirical studies have identified significant interactions between competition and productivity. Within and across countries, major differences appear at the sectoral level. These are entirely plausible since we know, for instance, that the mobile telecommunications sector in Austria is much more competitive than the same sector in France.

The econometric conjunction of competition intensity and inflation in-

dicates a significantly negative correlation for the period from 1991 to 2005, while this correlation breaks down for longer periods. Intuitively, it seems probable that a temporary inflationary impact is attributable to intensified competition, which means that it is certainly possible to correct rising inflation by employing competition policy measures. However, if the underlying cause of an uptrend in inflation is permanent, measures aimed at intensifying competition will have little effect.

Baumgartner's analyses (2008a, 2008b) have shown that price increases among selected Austrian product groups during the period between 2007 and 2008 cannot be attributed exclusively to the development of international commodity prices. Therefore, increased competition in the sectors concerned (and in other sectors as well) could be a contributing factor in moderating inflation. Böheim (2008a), for example, who is in favor of institutional reforms in competition policy, offers numerous options of how to intensify competition. The cornerstones of his suggestions include a reversal of the burden of evidence in antitrust proceedings; merging

the Federal Competition Authority and the Federal Cartel Attorney to establish a single, comprehensive competition authority; repositioning the competition commission as an autonomous expert body modeled on the German Monopolies Commission; transferring the right of first-instance decisions in antitrust cases to the Federal Competition Authority; and implementation of a forward-looking competition policy framework based on transparent, quantitative competition monitoring.

Janger (2010; in this issue) suggests a number of options for intensifying consumer-side competitive pressure, e.g. by employing awareness-raising measures to boost price comparison activity in sectors with low price com-

parison and switching rates, or by extending Internet price comparison to service sectors.

Finally, according to Böheim (2008b), a short-term curb on inflation can be achieved by promoting competition in the markets for network-bound energy and over-the-counter medications.

The new insight this paper provides is that intensified competition has a stabilizing effect on inflation and that a reduction in markups has a significantly negative impact on price variance.

In the dataset analyzed for this study, the correlation between price levels and competition intensity is not significant. Achieving a robust estimate would require significantly better data material.

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Annex

Table 2

Definition of Economic Sectors

Sector code	Industry
15–16	Manufacture of food products, beverages and tobacco products
17–19	Manufacture of textiles, textile products and wearing apparel, leather and footwear
20	Manufacture of wood and wood products (except furniture)
21–22	Manufacture of pulp, paper and paper products; publishing, printing and reproduction of recorded media
23	Manufacture of coke, refined petroleum products and nuclear fuel
24	Manufacture of chemicals and chemical products
25	Manufacture of rubber and plastics products
26	Manufacture and processing of glass, manufacture of other non-metallic mineral products
27–28	Manufacture of basic metals and fabricated metal products
29	Manufacture of machinery and equipment n.e.c.
30–33	Manufacture of office machinery, computers and other information processing equipment, and of electrical, precision and optical equipment
34–35	Manufacture of transport equipment
36–37	Manufacture of furniture, jewellery, musical instruments, sports goods, games and toys; miscellaneous manufacturing; recycling
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles
52	Retail trade, except of motor vehicles and of automotive fuel; repair of personal and household goods
60–63	Transport (land, water and air transport; activities of travel agencies)
64	Post and telecommunications
70	Real estate activities
71–74	Renting of machinery and equipment; computer and related activities; research and development; other business activities
A–B	Agriculture, hunting and forestry; fishing
C	Mining and quarrying
D	Manufacturing
E	Electricity, gas and water supply
F	Construction
G	Wholesale and retail trade
H	Hotels and restaurants
I	Transport, storage and communication
J	Financial intermediation
K	Real estate, renting and business activities
L	Public administration and defense, compulsory social security
M	Education
N	Health and social work
O	Other community, social and personal service activities
PRI	Total economy excluding public services (excluding L–O)
PRI_SE	Services excluding public services
Total	Total economy

Source: Statistics Austria.

Determinants of Price Comparison and Supplier Switching Rates in Selected Sectors

Jürgen Janger¹

This study looks into the factors determining price comparisons and supplier switching as revealed by a representative survey of Austrian consumers. Price comparisons and supplier switching can be interpreted as a measure of the competitive pressure that consumers exert on enterprises. Thereby, they influence the intensity of competition in an industry, which in its turn, curbs inflation and boosts growth.

The fundamental driver of switching is the comparison of prices. Those who compare prices not only consider price comparisons but also switching less cumbersome and, hence, switch suppliers more frequently. To a certain extent, search as well as switching costs are perceived to be higher than they actually are, i.e. persons inexperienced in searching and switching suppliers overestimate the difficulties involved.

Price comparison behavior is determined by educational attainment (education levels above apprenticeships), gender and (urban or rural) residence. While Internet use is limited for price comparisons, it reduces the efforts required for comparing prices and switching suppliers to a highly significant extent in all sectors. Moreover, search and switching costs play a major role in explaining sectoral differences in price comparison behavior. Therefore, competition intensity could be increased through education reforms, the promotion of Internet usage, sector-specific reductions of search and switching costs as well as awareness-raising measures. The results can be used for further analyses in the field of competition, productivity and inflation.

JEL classification: D12, L40

Keywords: switching costs, market elasticity, consumer behavior, competition intensity

This study was motivated by the inflation peak of 2008 and, with the help of a representative survey (IFES, 2008), tries to trace the levels and determinants of price comparison and supplier switching costs as well as price comparison and switching rates for six sectors. The data are presented in a transparent and easily accessible way to facilitate informed decision-making by competition agencies, and to provide a data source for further analyses in the field of competition, productivity and inflation. Given the existing evidence for the link between inflation and competition intensity, Böheim (2008) and Janger (2008) identify the strengthening of competition on a broader basis – i.e. not only when competition law is violated, but also when the competition level is empirically observed to be low in a sector – as a possibility for curbing price hikes at least temporarily (see

Janger and Schmidt-Dengler, 2010, in this issue, for a confirmation of this relation for the medium term). An increase in competition, however, not only dampens or stabilizes inflation, but as a rule also raises productivity and, along with it, growth (e.g. Aghion and Griffith, 2005; Nicoletti and Scarpetta, 2003). It is only when sectoral competition is very strong that adverse effects may occur in the form of reduced innovation (Crespi and Patel, 2008). The intensification of competition may form part of the crisis management strategies currently in planning because faster growth would support the consolidation of public finances (Grossmann et al., 2009).

This study is structured as follows: Section 1 highlights the economic connection of price comparison and supplier switching rates with competition intensity and market efficiency. Section 2 describes the results of the represen-

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tative survey on price comparison and switching activities. Section 3 gives an econometric analysis of the determinants of different price comparison and switching behaviors. Section 4 draws conclusions for economic policy and presents an outlook on potential further analyses.

1 Price Comparison and Supplier Switching Rates as Competition Indicators

Price comparison rates indicate the share of consumers of a product group who shop around before purchasing. Price comparison rates and their determinants such as search costs influence switching rates, i.e. the percentage of all consumers of a product group who switch to another supplier per unit of time – usually per year. In addition, the percentage of consumers who regularly switch suppliers can be taken into account in the switching rate.

Search costs include the opportunity cost of time spent searching as well as associated expenditures such as transportation cost for visiting several shops, telephone costs, costs for purchasing magazines, etc. (Bakos, 2001).

Switching costs are the costs of searching for an alternative product and the costs of the switch itself. Price comparison rates and their determinants mainly yield information on the search cost component of switching costs.

Klemperer (1995) describes the following switching costs:

1. Need for compatibility with existing equipment/products, e.g. razor blades and razors, PC operating system and word processing system or online music store coupled with a digital audio player;
2. Transaction costs (in terms of time and money) of switching suppliers, e.g. switching bank accounts;
3. Costs of learning for products that are functionally or qualitatively iden-

tical but differ in handling, e.g. different cake mixes, software packages;

4. Uncertainty about the quality or safety of new products, e.g. drugs;
5. Discounts promised for the future, e.g. airline mileage programs – the more frequently you travel on the same carrier, the lower the cost;
6. Psychological costs of switching: Brand loyalty, e.g. for food or cars.

There is socio-psychological evidence that consumers are initially indifferent about competing products, but change their relative preferences by using one brand so that they would perceive a cost of switching brands.

Switching costs may not necessarily be blamed on a given provider. Such costs might arise, for instance, because of a surge in inflation that makes price comparisons more difficult (Gwin and Taylor, 2004), or as a result of technological constraints; in brick production, for example, high product weights impede a geographical switch to alternative suppliers. Consumer characteristics, such as education, gender or place of residence (urban vs. rural areas), may also impact perceived and actual search and switching costs.

Companies may however actively attempt to create switching costs to shield themselves from competition. Advertising, for instance, is a tool for generating brand loyalty. The requirement of technological compatibility, which was already mentioned above, would hardly be necessary for product functionality in most cases. Therefore, price comparison rates, search and switching costs as well as switching rates are important competition indicators. They can be interpreted as a measure for the competitive pressure exerted on firms, i.e. as an indicator of a company's price elasticity of demand. The elasticity of demand is one of the determinants of the markup B_i of an

enterprise and, with reservations, is considered a proxy of competition intensity (e.g. Janger and Schmidt-Dengler, 2010): High markups may result from R&D efforts that justify temporary monopoly rents. Oliveira Martins et al. (1996) show that markups derived from Roeger's method are actually higher in R&D-intensive sectors. The fact that markups substantially vary across countries in these sectors, however, also points to

other explanations, such as competition intensity.²

The markup B_i , in terms of the Lerner index³, can be expressed as a function of the elasticity of demand ε_{ii} .⁴

$$B_i = \frac{P - MC}{P} = \frac{1}{\varepsilon_{ii}}$$

For the derivation of this relation, please see the box "Connection between Com-

Connection between Competition Intensity and Elasticity of Demand

The derivation of markups from company-specific elasticity is a textbook case of industrial economics. For a description, see for example Church and Ware (2000, chapter 2).

Let us assume that a monopolist produces the quantity Q at a price P and tries to maximize his profits π .

$$\pi(Q) = P(Q)Q - C(Q)$$

The first derivation yields the standard condition of equality between marginal costs MC and marginal returns MR .

$$P(Q) + \frac{dP(Q)}{dQ}Q = MC(Q)$$

By factoring out P , the left-hand part can be transformed:

$$P\left(1 + \frac{dP(Q)}{dQ} \frac{Q}{P}\right) = MC(Q)$$

Given $\varepsilon = -\frac{dQ}{dP} \frac{P}{Q}$ as the monopolist's demand elasticity, the markup B can be described as a function of elasticity:

$$B = \frac{P - MC}{P} = \frac{1}{\varepsilon}$$

In the case of company-specific demand elasticities, e.g. in oligopolistic markets, the relationship is as follows:

$$B_i = \frac{P - MC}{P} = \frac{1}{\varepsilon_{ii}}$$

where $\varepsilon_{ii} = -\frac{dq_i}{dp_i} \frac{p_i}{q_i}$

² Markups might also be low because employees take up a major share of the economic rent that can be achieved on the basis of market power or because there is little pressure on shareholders to push up profits. These effects, however, are likely to be minor especially for the years from 1991 to 2005 as wage shares decreased in most countries and shareholders' profit expectations tended to rise.

³ The difference between price and marginal costs in relation to the price.

⁴ The way in which the quantity of the good sold by company i responds to a change in the price by that company in contrast to the cross-price elasticity ε_{ij} , i.e. the response of the quantity sold by company j to a price change of company i .

petition Intensity and Elasticity of Demand.” The higher the elasticity of demand, the lower the markup and the higher the intensity of competition. If quantities demanded respond strongly to price changes, i.e. if buyers purchase much less or switch to another supplier when prices go up, prices will approximate marginal costs. Therefore, being elasticity determinants, price comparison and switching rates have an indirect impact on competition intensity.

Theoretical models of industrial economics explicitly take account of the effect of search and switching costs on market efficiency. According to Stahl (1989), the height of search costs determines the share of informed consumers in a market. The lower the search costs, the higher the share of informed consumers and the lower the price dispersion in a market. The market price will tend towards price levels under perfect competition, i.e. lower search costs lead to more efficient market results.

In mature markets, switching costs bring about monopoly rents (Klemperer, 1987). Therefore, suppliers fight hard for market shares in the initial stage of a market (e.g. mobile telephony). The market equilibrium of an oligopolistic industry with switching costs, but noncooperative behavior of market actors may be similar to the one in an oligopolistic industry with collusion but without switching costs. Sharpe (1997) empirically confirms this theory for the savings deposit market: The higher the switching rate in a market, the lower the markups (or the higher the interest rates on savings deposits).

Observations of switching costs and rates are empirically valuable competition indicators because regular statistical data usually do not allow for separating the impact of companies' competitive behavior on the markup from the in-

fluence of elasticity (see the box “Connection between Competition Intensity and Elasticity of Demand”). This also means that a market's competition intensity may develop independently from the number of suppliers or the degree of market concentration. For that reason, competition agencies undertake regular monitoring exercises within the framework of their market analyses to assess competition intensity by means of switching rates. For that purpose, they usually carry out highly specific ad hoc investigations or surveys that are tailored to the case at hand and are generally treated as classified. Exceptions to this rule are the European Consumer Markets Scoreboard (European Commission, 2009) that lays out price comparison and switching costs and rates for several service sectors as well as a few large-scale sector-specific studies, for example, on checking accounts (OFT, 2008) or retail banking (European Commission, 2007). However, these usually do not provide links to the personal characteristics of the consumers responding.

When interpreting information on search and switching costs as well as price comparison and switching rates, we have to bear in mind the possibilities for price discrimination and product differentiation. In spite of high price comparison rates or low search costs (i.e. high, but incomplete information), sectoral competition intensity may be restricted by means of price discrimination and product differentiation. In food retailing, for example, outlet strategies allow for price discrimination (brand portfolios and discount portfolios that include similar or the same products), and product differentiation is particularly pronounced (e.g. regionality of dairy products).

2 Survey Results in Descriptive Form

In the late fall of 2008, the Institute for Empirical Social Studies (IFES) conducted personal interviews with 2,000 respondents selected by stratified random and grouped sampling in an ad hoc module of the OeNB's regular Payment Survey.⁵ The quality of data obtained in such a way is considered to be high. The survey concentrated on six sectors or products: First, sectors that were key drivers of inflation when inflation peaked in 2008 (food, motor fuels); second, industries that are well known for intensive comparison and switching behavior (electric and electronic products); and third, service sectors in which price comparison and switching rates are considered to be low (banking (checking accounts), insurances (home insurances) and a range of trades (regular services, such as heating system maintenance, vehicle inspections)).

The interview strategy was such that price-induced switching was considered to be conditional on price comparisons, while quality aspects were treated as an afterthought. If switching costs and rates had been surveyed alone, a significant aspect of market activities – price comparisons – would have been disregarded. As a result, important information on price comparison and switching behaviors as well as their determinants would not have been revealed. A switch to another supplier is just the second step in making a purchasing decision – the disclosed preference, as it were –, while the price comparison behavior really indicates whether consumers subject product groups to intensive competition or not.

The European Consumer Markets Scoreboard, for example, also contains

questions on price comparison efforts, but does not check the percentage of consumers actually comparing prices. In this study, the combination of these data provides important insights (section 3). Nevertheless, the results of the Consumer Markets Scoreboard are used for comparisons.

2.1 Price Comparison and Switching Behavior

The switching rates not only include actual switches from one supplier to another one but also regular purchases from different suppliers (or “household migration in a market” according to Sharpe (1997)). The rate of switching between suppliers is a typical indicator for service industries with long-term contracts, such as checking accounts, insurances, mobile telephony. Therefore, switching rates are expected to be lower than in manufacturing industries without product lock-in, e.g. in the food and motor fuels sector. With regard to price comparison behavior, however, the difference should be much less marked because a one-time switch to a less expensive service provider may well result in similarly high savings as weekly switches for food purchases.

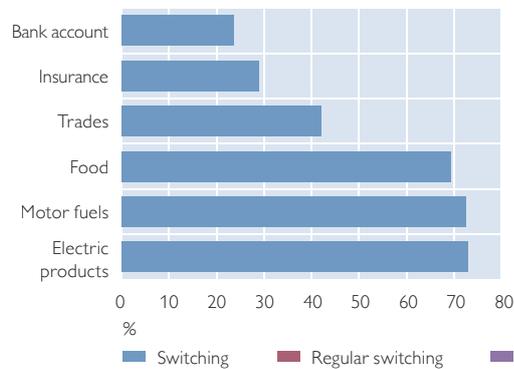
Chart 1 presents the price comparison and switching rates for the six sectors selected. The data have been adjusted for nonconsumers of the respective sectors, i.e. for persons never buying food (6.6%) or not having a personal account (5.7%), etc. In addition to the switching rate proper, further components were included in the phenomenon of switching activity: The percentage of consumers regularly using several suppliers, the percentage of consumers who stated to have the least expensive supplier so that switching would not

⁵ The author thanks Helmut Stix for this opportunity. The complete questionnaire is available from the author upon request.

Chart 1

Price Comparison and Switching Rates

Price Comparison Rates



Switching Activity



Source: OeNB.

make sense for them and the percentage of consumers switching for reasons other than price. The latter group is small in comparison with “price-driven switchers” so that it is safe to assume that the focus on price comparison behavior (vs. quality comparison behavior) will not introduce a strong bias. Differences are pronounced both between price comparison rates and between switching rates, with low rates recorded for the service sectors and high ones for the manufacturing industries.⁶ Notwithstanding a relatively high share of consumers believing to have already secured the cheapest banking (checking account) or insurance services (home insurance), switching activity is significantly lower in these two segments than in the manufacturing industries.⁷ For the services of trades, the difference is slightly less distinct. Thus, evidence would point to a low company-specific elasticity of demand in the latter three sectors, whereas it seems to be relatively high for food and motor

fuels as well as electric and electronic products.⁸

Because of the inflation peak for food and motor fuels recorded in 2008, the values could be above the medium-term average. This can only be clarified by a follow-up survey. Compared with other countries, the switching rates in the Austrian service sectors are below the European average (European Commission, 2009).

2.2 Information Sources for Price Comparisons

The type of information sources and the intensity of their use can provide information on search costs. Chart 2 highlights the first and second most frequent information sources indicated (multiple answers were possible) and Internet usage for price comparisons. In many cases, the Internet can greatly facilitate price comparisons. Nevertheless, Internet usage is only significant in electric and electronic retailing where consumers frequently visit diverse web

⁶ Food, electric equipment and motor fuel retail trade are also service sectors, but they sell goods and not services.

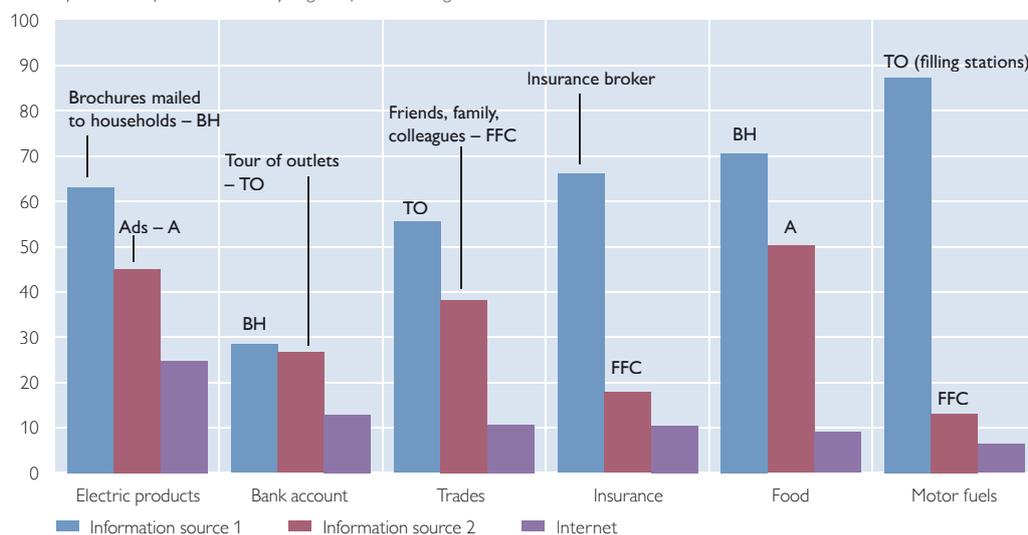
⁷ Section 3 demonstrates that persons stating that they already use the least expensive supplier are significantly less likely to compare prices. Therefore, actual switching activity could be even lower.

⁸ Company-specific elasticity of demand may be high in spite of a low price elasticity of demand for the entire market, e.g. the overall price elasticity of demand is relatively low in the food sector.

Chart 2

Information Sources for Price Comparisons

%; multiple answers possible; ranked by degree of Internet usage



Source: OeNB.

platforms for price comparisons. In sectors with intensive price comparison activities, however, the main information sources are brochures mailed to households and different kinds of advertisements. Through these two channels, prices are communicated to consumers fairly proactively, while in the service sectors consumers are typically challenged to get price information themselves. For insurances, the price comparison “power” lies with insurance brokers. There is no anecdotal evidence that insurance brokers would regularly send price comparisons to households. Likewise, the frequent identification of friends, family and colleagues as an information source can be taken as a sign of high price comparison efforts and the avoidance of price competition by enterprises.

2.3 Reasons for Not Comparing Prices

Chart 3 analyzes the behavior of those consumers who do not compare prices. Here, answers were compiled in two

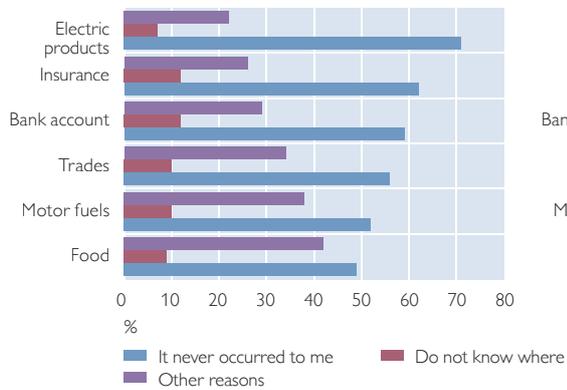
steps. In a first step, respondents were offered the following answer options: “It never occurred to me” (to compare prices), “I do not know where” (to get information on prices) and “Other reasons.” The first answer points to lacking awareness of the possibility of comparing prices and/or switching suppliers. This lack is not attributable to consumers alone, but could also be caused by relevant advertising activities and the building of brand loyalty. Many insurance companies and banks, for example, do not use prices in advertising, but try to generate popularity and trust through reputation advertising. The second option yields the share of persons who would like to compare prices, but do not know where to do so. This points to supply-side obfuscation or the inability of consumers to gather and assess information.

In a second step, the “Other reasons” were specified in greater detail. The main aim was to determine the cost-benefit ratio of price comparisons. When you understand search costs as

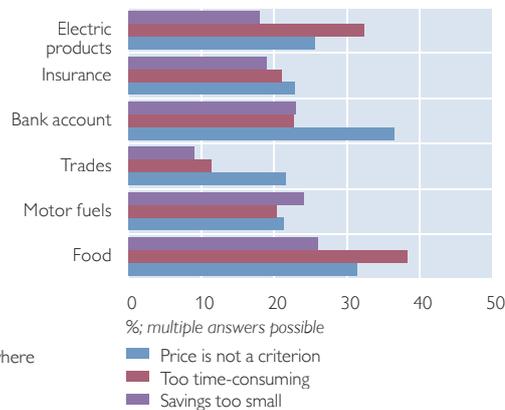
Chart 3

Reasons for Not Comparing Prices

Price Awareness vs. Lack of Information



Cost-Benefit Ratio (Other Reasons)



Source: OeNB.

an investment, searches are only carried out if the return on this investment is sufficiently high. Here it is difficult to distinguish whether potential savings or the size of the search costs are responsible for the final outcome (multiple answers were possible).

Furthermore, chart 3 indicates that the predominant reason for not comparing prices is the consumers' lacking awareness of price comparison options. However, we have to bear in mind that the populations differ strongly (e.g. only a few consumers for electric products vs. many consumers in banking). Supply-side obfuscation amounts to roughly 10% and is slightly higher for banks and insurance companies. This value is relatively low, but if all 10% of consumers started to compare prices this would certainly stimulate each of the sectors examined.

An analysis of the other reasons identified shows that the cost-benefit ratio plays a role for a strong minority of consumers (20% to 40%) so that the reduction of search costs might well contribute to a reassessment of this ratio, as in the model from Stahl (1989) cited above. Otherwise, there could be

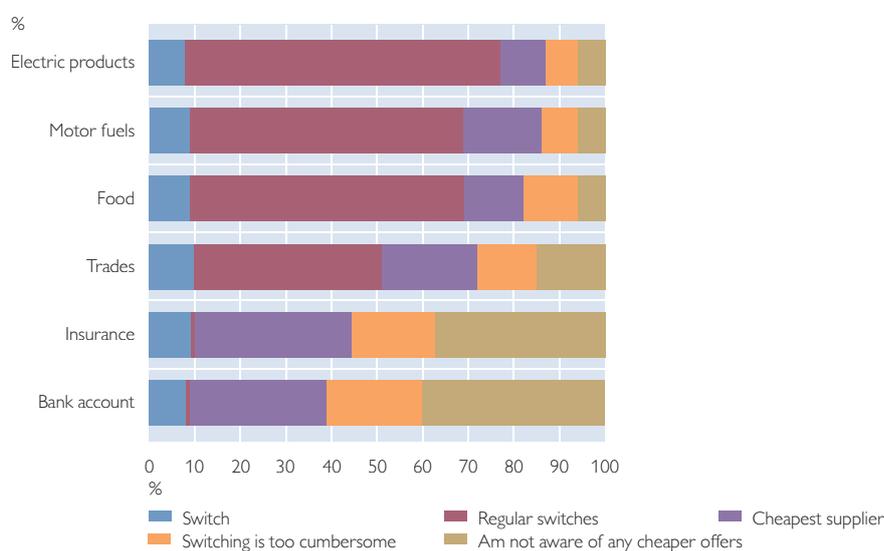
a stable equilibrium of little switching and a lack of attractive offers in sectors with low switching activity: If the switching rate is minimal because of either high switching costs or lacking price awareness, there is hardly an incentive for companies to offer new products and this, in its turn, hardly motivates customers to switch suppliers. This cycle of effects was also found for the British checking account market (OFT, 2008).

2.4 Switching Rates

While chart 1 outlined switching activities, chart 4 presents all the facets of the question on whether consumers switch suppliers and, if not, why. The additional dimensions "Switching is too cumbersome" and "Am not aware of any cheaper offers" play a role especially in the case of banks and insurance companies; the latter answer virtually is the flipside of price comparison behavior and confirms the interview strategy's focus on price comparisons.

In particular for the banking and insurance sector but also for different trades, chart 4 (as well as charts 1 and 5) provides clues that the company-specific

Chart 4

Switching Activity and Reasons for Not Switching

Source: OeNB.

demand could be inelastic for the products of firms in these sectors. This is all the more true as companies additionally have possibilities for price discrimination and product differentiation. In banking, for example, a classic case of price discrimination is student accounts. However, a comprehensive assessment can only be given after more extensive investigations modeled after international studies such as the one carried out by the British Office of Fair Trading (OFT, 2008).

Price discrimination and product differentiation can reduce competition intensity even in sectors with strong switching activity, e.g. in food retailing. Therefore, the survey presented here is to be seen as a first step in the evaluation of competition intensity.

2.5 General Price Comparison and Switching Efforts

At the end of the questionnaire, a batch of questions readdressed the issue of price comparison and switching efforts collectively because the above questions

about search and switching costs had been skipped in the interview of those consumers who compare prices or switch suppliers. Since we did not use the full range of questions and wanted to get more data for comparisons, we added two product groups (electricity and mobile telephony). The answer “I do not know how cumbersome it is to switch suppliers/compare prices” also permits conclusions on switching and search activities.

Chart 5 shows that price comparison and switching efforts are almost identical or perceived as such. The sectors can be grouped in three categories: First, sectors with little efforts (motor fuels, electric products and food), second, sectors with medium efforts (trades, mobile telephony) and, third, sectors with high efforts (checking accounts, home insurance and electricity). In a European comparison, Austria stands out as a country where consumers find it most difficult to compare prices in service sectors (European Commission, 2009). Hence, the survey corroborates

Chart 5

Price Comparison vs. Switching Efforts



Source: OeNB.

studies of OECD (2007) that showed low competition intensities in service sectors.

This again supports the focus of the questionnaire on price comparison behavior. Mobile telephony is an example illustrating that competition can be fierce in spite of perceived high search and switching costs – in the early stages of a market, as described above. Over time, search and switching costs are likely to result in a declining level of competition.

3 Econometric Identification of Price Comparison and Switching Determinants

In addition to the answers to the questions proper, the survey collected data on numerous personal parameters, such as education (level of educational attainment), income (net personal income), gender, place of residence, Internet usage, occupation (employment vs. school attendance, retirement, etc.)

and social class⁹. By means of these personal characteristics and the responses to the above-mentioned questions, this section tries to identify significant determinants of price comparison and switching activity.

The answers of the individual respondents are adjusted by their sample weights before estimations are performed.¹⁰ Apart from income data, the individual variables are almost complete; around 25% of the respondents did not provide information on their earnings. The missing values were imputed from other available variables. The variables, even the income variable, are not continuous, but contain category numbers (e.g. 1 for income brackets from EUR 500 to EUR 750, 2 for EUR 751 to EUR 1,000, etc.). The original categories defined for the survey were regrouped because of their high number and converted into dummy variables. Table 3 (in the annex) describes the variables and identifies the related ref-

⁹ A variable constructed from income and education data on the respondent and the household head's occupational status by IFES, the institute carrying out the survey.

¹⁰ In the case of divergence from the population structure, the structure of the actual interviewees is adjusted to the population structure by weighting to obtain a really representative sample.

erence category for the interpretation of estimates.¹¹ The software package Stata 10 is used to perform the estimates.

3.1 Determinants of Price Comparisons

The factors influencing the probability of price comparisons are estimated by means of a simple binary model of the functional logit type (e.g. Cameron and Trivedi, 2009).

$$p_i \equiv \Pr(y_i = 1 | x) = \Lambda(x_i' \beta) = \frac{e^{x_i' \beta}}{(1 + e^{x_i' \beta})}$$

where:

$$x_i' \beta = \beta_1 + \beta_2 \text{Income} + \beta_3 \text{Gender} + \beta_4 \text{Place of residence} + \beta_5 \text{Occupation} + \beta_6 \text{Social class} + \beta_7 \text{Education} + \beta_8 \text{Internet}$$

Without exception, the determinants should be independent of the probability of price comparison, the variable to be explained.

Table 1 shows the coefficients estimated for the preferred specification. In binary models, the coefficient cannot be directly interpreted as a marginal effect or as a contribution to the probability of occurrence for the event investigated. Therefore, table 1 only reveals whether a specific variable significantly influences the probability of occurrence and, if yes, whether this impact is positive or negative. An example of the calculations is given below. Because of the correlations existing between the explanatory variables, in particular between education, income and social class, the coefficients are not completely stable, but as a rule, retain their significance level and at any rate their positive/negative sign for many different

estimation specifications. For example, a constituting variable of the social class – the occupational status of the household head (worker, employee, liberal profession, etc.) – was used instead of the social class itself to minimize the correlation with education and income. This, however, only resulted in marginal changes.

Higher net personal incomes only significantly reduce the probability of price comparisons for electric products, while their impact, by and large, remains insignificant for the other sectors. This is surprising since a higher income normally means higher opportunity costs for the time spent on price comparisons. Women are significantly less likely to compare prices of electric products, home insurances, regular services of trades as well as motor fuels, while they are significantly more likely to make food price comparisons.¹² Price comparisons for electric products, checking accounts and home insurances have a significantly lower probability in cities. Retirees perform significantly fewer price comparisons for checking accounts, while homemakers are significantly more likely to compare food prices, just like members of lower social classes. The latter, however, carry out significantly fewer comparisons of checking account fees. Persons without access to the Internet are significantly less likely to compare prices for home insurances because they can only do so by calling their insurance broker.

The most interesting finding is that higher education levels raise the probability of price comparisons in almost all cases. At education levels above com-

¹¹ We experimented with numerous types of categorization by defining more or less income classes and more or less education categories and by shifting the limits of the individual ranges, etc. These different grouping types relying on the basic pattern of low/high only have a marginal impact on coefficients.

¹² The gender variable only takes account of those women and men who actually purchase products. Therefore, the results are not distorted by persons not buying the relevant products.

pulsory schooling plus apprenticeship, the probability of price comparisons increases for all sectors with the exception of motor fuels and the services of trades.¹³ This might be explained by the intensified promotion of interdisciplinary skills in upper secondary and tertiary education that could also be relevant for comparing prices: Analyzing and critically evaluating information is considered an important interdisciplinary skill that might apparently be neglected in compulsory schooling and apprenticeships.

To illustrate their economic significance, average marginal effects were

calculated from the coefficients presented in table 1.¹⁴ Thus, university education increases the probability of comparisons for home insurance premiums by 12%, while the absence of Internet access reduces it by 5%. These differences are relevant in economic terms.

3.2 Reasons for a Lack of Price Comparisons

The survey defined three possible answers for not comparing prices. Therefore, a multinomial logit model is estimated that calculates for each explanatory variable the way in which it

Table 1

Determinants of Price Comparisons: Factors Influencing the Probability of Price Comparisons

	Food	Electric and electronic products	Current accounts	Home insurance	Trades	Motor fuels
Income – low	0.231	-0.377*	0.053	0.293	0.400*	-0.073
Income – medium	0.047	-0.690***	0.275	0.521***	0.318	-0.298
Income – high	-0.031	-0.643**	0.220	0.070	0.123	-0.105
Gender	0.431***	-0.471***	-0.090	-0.324**	-0.412***	-0.292**
Place of residence	-0.043	-0.457***	-0.348***	-0.654***	-0.147	0.177
Occupation – jobless	0.037	-0.672**	0.212	-0.074	-0.018	-0.947**
Occupation – student	-0.718***	-0.370	-0.263	0.105	-0.001	-0.605**
Occupation – retired	0.186	0.045	-0.312*	-0.185	-0.224	-0.196
Occupation – home	1.167***	-0.220	-0.379	0.441	0.389	-0.079
Class – B	0.432*	0.285	-0.571**	0.335	0.077	0.364
Class – C	0.469*	-0.180	-0.451*	0.179	0.051	0.134
Class – D	0.324	-0.093	-0.314	0.369	0.119	-0.434
Class – E	0.754**	0.174	-0.786**	0.255	1.226***	0.244
Education – apprenticeship	0.286	0.076	0.204	0.055	0.361*	0.130
Education – vocational school	0.693***	0.812***	0.417*	0.481**	0.611**	0.109
Education – upper secondary school	0.542**	0.701***	0.462*	0.407	0.812***	0.402
Education – university	0.284	0.758**	0.150	0.583*	1.139***	0.685*
Internet	0.009	0.095	0.056	-0.252*	0.196	0.148
Constant	-0.240	1.519***	-0.880**	-1.165***	-1.026***	1.005**
Observations	1,817	1,680	1,849	1,645	1,448	1,540

Source: Author's calculations.

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

¹³ The effect is not significant for persons with university education in the food sector and for checking accounts (but the sign is positive).

¹⁴ To calculate the marginal effect of variable x on the probability of occurrence for variable y , the probability function is partially differentiated with respect to x . The marginal effect $\partial p / \partial x_j$ for the logistic function

$$p_i = \Pr(y_i = 1 | x) = \Lambda(x_i' \beta) = \frac{e^{x_i' \beta}}{(1 + e^{x_i' \beta})} \quad \text{is} \quad \Lambda(x_i' \beta) \{1 - \Lambda(x_i' \beta)\} \beta_j$$

influences the probability of occurrence of the option $y_i=j$ relative to the base case $y_i=1$ (e. g. Cameron and Trivedi, 2009):

$$\Pr(y_i = j | y_i = 1) = \frac{\Pr(y_i = j)}{\Pr(y_i = j) + \Pr(y_i = 1)} = \frac{e^{x_i \beta_j}}{(1 + e^{x_i \beta_j})}$$

The explanatory variables used are the same as in section 3.1. Table 4 (in the annex) presents the results for each sector. The first half shows the figures for the impact of the explanatory variables on the respondents' probability of selecting the option "It never occurred to me" instead of the base case "Other reasons" (for not comparing prices). By analogy, the second half indicates the results for the option "I do not know where" (to get information on prices). Given the low number of observations, the data for food, electric and electronic products as well as motor fuels have to be analyzed with caution and especially the food sector is, in fact, not interpretable.

Among persons with incomes (above those of the lowest income group) the share of those who do not bother to compare prices for checking accounts and home insurances is significantly higher than among all other income groups. At the same time, comparing checking account fees is not an issue for the two lowest social classes, either.¹⁵ Women do not compare motor fuel prices for other reasons, while city dwellers tend not to reflect on such prices. Persons with university education refrain from price comparisons in all sectors – except food and electric products – for other reasons.

Persons who do not have access to the Internet are significantly more likely to fail to know where to compare the prices of home insurances. Apart from that, the results for the answer "I do not know where" only show a few significant correlations.

Because of the low number of observations, an econometric analysis of "Other reasons" does not make sense. With regard to the important issue of excessive time required, the general time-related question (section 3.4) yields substantially better information.

3.3 Determinants of Switching Suppliers

A multinomial model is estimated in order to clarify the reasons why consumers switch suppliers or not. Out of the six answers to the question on supplier switches, the first four options were summarized as they all stand for switching activity and/or for exploiting market opportunities. This group is compared with the responses "There are cheaper [shops], but switching to them is too cumbersome" and "Since I do not compare prices I do not know a cheaper supplier."

In addition to the usual explanatory variables, the question on price comparisons was also included here. This is a key finding of the estimation (table 5 in the annex): Persons who compare prices assess switching to be less arduous in all sectors and/or switch suppliers with high significance.

Even when they know cheaper suppliers, persons with high incomes and women find it laborious to switch providers of regular services of trades; city dwellers consider switching suppliers significantly less cumbersome for electric products and motor fuels and

¹⁵ An explanation of this apparent contradiction might be that account fees are too low for triggering price comparisons by persons with higher incomes, while persons from lower social classes have insufficient information and education for actively considering to switch bank accounts.

more complicated for home insurances. Retirees perceive switching to be too arduous in almost all sectors. Persons with education levels above apprenticeships find switching troublesome for food, electric products and motor fuels. Persons without Internet access consider switching motor fuel suppliers to be too cumbersome.

The option “Since I do not compare prices ...” is essentially driven by factors that also determine price comparison behavior (education, place of residence) and serves for checking consistency.

In addition to grouping the first four possible responses together, the data for the answer “I already have the cheapest

supplier” were analyzed separately. In the checking account, home insurance and motor fuel sectors, persons without Internet access are significantly less likely to fall into this group. Likewise, this group includes significantly fewer persons who compare prices. Therefore, the statement “I already have the cheapest supplier” would have to be called into question.

3.4 General Price Comparison and Switching Efforts

As explained above, separate questions addressed the efforts involved in comparing prices and switching suppliers at the end of the questionnaire in order

Table 2

Who Finds Comparing Prices Cumbersome?

	Food	Electric and electronic products	Current accounts	Home insurance	Trades	Electricity	Motor fuels	Mobile telephony
Income – low	-0.362**	-0.530***	-0.514***	-0.643***	-0.669***	-0.534***	-0.216	-0.515***
Income – medium	0.061	-0.272	-0.629***	-0.699***	-0.622***	-0.557***	0.091	-0.213
Income – high	0.075	-0.021	-0.074	-0.405	-0.217	-0.362	0.139	0.047
Gender	0.107	0.376***	0.047	-0.097	0.272**	0.154	0.242	0.257**
Place of residence	-0.656***	-0.355***	0.338***	0.299**	0.345**	0.310**	-0.411**	-0.083
Occupation – jobless	0.464	0.366	-0.193	-0.646*	-0.564	-0.181	0.133	-0.200
Occupation – student	0.441*	-0.461*	-0.516*	-0.295	-0.245	-0.324	0.376	-0.225
Occupation – retired	-0.039	-0.150	-0.108	-0.274*	-0.304*	0.024	-0.337*	0.014
Occupation – home	-0.412	-0.553*	-0.145	-0.131	-0.034	0.274	-0.416	0.078
Class – B	-0.007	0.459*	0.332	0.302	0.536**	0.023	0.722**	0.266
Class – C	-0.367	0.266	0.169	0.306	0.744**	-0.034	0.748**	0.318
Class – D	0.035	0.226	0.096	0.231	0.479	-0.074	1.228***	0.192
Class – E	-0.497	-0.049	0.533	0.680*	0.596	0.251	0.921*	0.824**
Education – apprenticeship	0.295	-0.051	-0.057	0.169	0.016	0.250	0.378	-0.066
Education – vocational school	0.331	0.004	0.321	0.808***	0.171	0.567**	-0.149	0.132
Education – upper secondary school	0.533**	0.337	0.292	0.984***	0.835***	0.344	0.755**	0.361*
Education – university	0.108	0.055	0.372	1.048***	0.555*	0.276	0.743*	0.634**
Internet	0.244*	0.498***	0.437***	0.445***	0.458***	0.540***	0.774***	0.596***
Price comparison yes	-0.689***							
Price comparison yes		-0.088						
Price comparison yes			-0.572***					
Price comparison yes				-0.777***				
Price comparison yes					-0.301**			
Price comparison yes							-0.898***	
Constant	-0.254	-1.010**	0.362	0.410	-0.600	0.555	-2.037***	-0.503
Observations	1,782	1,635	1,654	1,491	1,378	1,703	1,499	1,710

Source: Author's calculations.

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

to raise the number of observations. The factors determining the probability that price comparisons or switches are perceived as laborious were estimated by means of a simple logit model as described above.

For price comparison efforts, persons who actually compare prices also assess these efforts to be lower with high significance, as explained in section 3.3. Persons without Internet access find price comparisons substantially more laborious. Women believe that comparing prices of electric products, trades services and mobile telephony requires more efforts. City dwellers perceive price comparisons to be less arduous for food, electric products and motor fuels and more cumbersome for checking accounts, home insurances and the services of trades. This could be due to the fact that the number of suppliers facilitates comparisons in the first three sectors, whereas price comparisons are more complex in the other sectors and rural areas have a lower supplier density; this makes comparisons easier (“spoiled for choice”). Likewise, persons with education levels above apprenticeships frequently find price comparisons troublesome.

The results for switching efforts are in line with those for price comparisons (table 2).

4 Conclusions

The results of this survey – the first representative one of this type for Austria – can be applied in many ways. On the one hand, they highlight several areas for stimulating sectoral price comparison and switching activities and thereby competition intensity. Intensive competition dampens inflation in the medium term and has a stabilizing effect on inflation; as a rule, it raises productivity. On the other hand, the data can be used as a basis for further analyses.

Surveying price comparison behavior proved to be effective since the fundamental driver of switching is price comparisons. Those who compare prices not only consider price comparisons but also switching less cumbersome and, hence, switch suppliers more frequently. This also shows that to a certain extent, search as well as switching costs are perceived to be higher than they actually are, i.e. persons inexperienced in searching and switching suppliers overestimate the difficulties.

Intersectoral Measures

In a medium- to longer-term perspective, there are two approaches to encouraging price comparison behavior that, in part, require further analysis: Education reforms and gender differences. Educational attainment has a significantly positive effect on the probability of price comparisons, while the price comparison behavior of women and men differs by sector. Women compare prices significantly less often for electric products, home insurances, regular services of trades and motor fuels, but more frequently for food. The reasons for these differences would have to be examined in greater detail. The starting points for analyses are likely to be found in typical career choices of women and men (low share of women in technical occupations which, in its turn, is related to the educational system) as well as in women’s stronger involvement in household activities.

Because of the time required for educational reforms, such reforms are certainly not suited as short-term measures to control inflation.

In the short- to medium-term perspective, the survey indicates that while Internet usage has been limited as yet for the purpose of price comparisons, searching the web very significantly facilitates price comparisons and switch-

ing in all sectors.¹⁶ Internet use can be supported through several channels: On the one hand, by fostering competition in the broadband segment where Austria still lags behind countries with high competition intensities and, on the other hand, by ensuring the further improvement of the technological infrastructure that additionally stimulates the economy.

Finally, the outcome sets the scope for promoting awareness-raising measures, e.g. by means of officially supported information on prices – as it is already provided by the Chamber of Labor today – for sectors that hardly use their product prices in advertising and do not actively communicate them to consumers in contrast, for example, to food retailers.

Sector-Specific Measures

As the survey shows, there are in part considerable obstacles to comparing prices and switching suppliers and the cost-benefit ratio of price comparisons is frequently poor. This result is confirmed by EU surveys. Overall, the low competition intensities found in some service sectors by international organizations are supported by this study.

Low price comparison and switching costs can keep sectors in an equilibrium in which consumers do not switch because there are no attractive alternatives and enterprises do not develop attractive products because consumers do not switch. Thus, switching costs can effectively hinder innovation and make market entry more difficult for newcomers (the return on innovation projects decreases if the switching rate is expected to be low).

Therefore, detailed studies modeled after other countries should be prepared for sectors with minimal price comparison and switching activity.

Price comparison websites could take over the function of providing regular price information that is fulfilled by brochures mailed to households in sectors with high switching activity. In the insurance sector, for example, existing price comparison websites could be used more intensively when Internet use rises.

Of course, “normal” competition policy remains relevant for enforcing competition law. The survey also revealed that price comparison activities decline with rising incomes in a few sectors. If the elasticity of demand decreases, it becomes more important again to focus on issues of market concentration in competition policy.

Perspectives for Further Analysis

Another step in investigating the determinants of price comparison and switching behavior would be harmonized international surveys. An issue that remains unclear in this survey is the impact of differences between urban and rural areas on price comparison and switching activity. While city dwellers compare prices less frequently, they consider the efforts required to be higher in some sectors and lower in others. Because of the advantages offered by the higher supplier density in cities, a more homogeneous picture would have been expected.

The survey’s data can also be used for further analyses. If comparable international data become available, in-depth studies can be carried out, for example, on competition, productivity and inflation. The survey also suggests that the determinants of search costs are very similar to those of switching costs so that they could be covered together in theoretical models.

¹⁶ In case of a strong increase of price comparisons on the Internet, firms are likely to respond by making their offering more difficult to compare (e.g. Ellison and Ellison, 2009).

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Annex

Table 3

Description of Dummy Variables

Variable	Range	Share (%)	Reference category
Income – very low	Up to EUR 750	28	yes
Income – low	EUR 751 to EUR 1,350	32	
Income – medium	EUR 1,351 to EUR 2,100	33	
Income – high	EUR 2,101 or more	8	
Place of residence	0 = cities with less than 50,000 people	68	n.a.
	1 = cities with more than 50,000 people	32	
Gender	0 = male	49	n.a.
	1 = female	51	
Education – no apprenticeship	Compulsory schooling	19	yes
Education – apprenticeship	Compulsory schooling plus apprenticeship	40	
Education – vocational school	Technical or vocational middle school	15	
Education – upper secondary school	Upper secondary academic or vocational school, university access examination	17	
Education – university	Technical college, university, academy of education, academy for social work	9	
Occupation – jobholders	Full- or part-time employees	60	yes
Occupation – jobless	Unemployed, alimony recipient without income	3	
Occupation – student	Apprentice, pupil, student	8	
Occupation – retired person	Retired person	23	
Occupation – home	Homemakers without own income	5	
Class – A	Highest social class	10	yes
Class – B		21	
Class – C		41	
Class – D		18	
Class – E		9	
Internet	0 = Internet access at home	57	
	1 = no Internet access	43	

Source: OeNB, IFES.

Table 4

Why Are Prices Not Compared?

	Food	Electric and electronic products	Checking account	Home insurance	Trades	Motor fuels
Factors influencing the probability of selecting the option "It never occurred to me" versus the base case "Other reasons" ¹						
Income – low	0.108	-0.378	0.440*	0.741*	0.243	0.390
Income – medium	0.647	-0.823	0.611*	0.852**	0.877*	-0.543
Income – high	0.176	-2.081	0.942*	0.585	-0.601	-1.615
Gender	0.207	-0.242	-0.024	-0.065	0.142	-0.672*
Place of residence	-0.412	0.078	0.024	0.232	0.090	0.872*
Occupation – jobless	-0.135	-1.755	0.834	0.128	-2.941**	-1.351
Occupation – student	0.657	-0.259	-0.011	0.286	1.220	-2.050*
Occupation – retired	-0.068	0.551	0.080	0.199	-0.381	-0.126
Occupation – home	2.307*	0.461	0.294	1.026*	-0.201	0.319
Class – B	-0.896	-0.972	0.385	-0.145	-0.052	-1.556*
Class – C	0.230	-0.685	0.440	0.157	-0.352	-1.520
Class – D	-0.157	0.039	1.250**	0.529	0.160	-1.198
Class – E	0.195	-2.144	1.342**	0.633	-0.649	-0.914
Education – apprenticeship	0.540	0.605	0.144	0.114	-0.137	-0.306
Education – vocational school	0.505	0.386	-0.050	-0.121	-0.652	-1.162*
Education – upper secondary school	0.650	0.318	-0.380	-0.508	-0.088	-0.978
Education – university	0.236	1.559	-0.653*	-0.962*	-1.286*	-2.782**
Internet	0.124	-0.542	-0.263	-0.179	0.055	-0.904*
Constant	-0.513	2.278	-0.136	0.184	0.640	3.177*
Factors influencing the probability of selecting the option "I do not know where" versus the base case "Other reasons" ¹						
Income – low	0.671	0.791	0.409	0.144	-0.200	-0.001
Income – medium	0.817	-1.425	0.166	0.066	0.484	-0.678
Income – high	-28.761**	-0.688	0.188	0.139	-1.319	-0.056
Gender	0.735	-0.906	0.225	0.264	-0.307	-0.667
Place of residence	-1.376*	0.582	-0.194	-0.082	-0.670	-0.120
Occupation – jobless	-0.365	-36.081**	0.081	0.248	0.941	-34.787**
Occupation – student	1.871*	-34.590**	0.190	0.600	1.435	-1.629
Occupation – retired	0.937	0.319	0.176	0.036	0.181	1.120
Occupation – home	1.995	-33.537**	0.461	0.033	-0.562	-33.067**
Class – B	17.077	-0.300	0.138	-0.049	0.897	-33.791**
Class – C	17.729**	-0.503	0.231	0.509	0.129	-0.439
Class – D	17.745**	0.156	0.888	0.972	0.029	-0.016
Class – E	20.083**	-0.202	1.111	0.768	0.800	0.982
Education – apprenticeship	2.079*	0.696	0.097	0.708*	-0.925	0.019
Education – vocational school	2.442*	0.543	-0.106	-0.222	-1.013	-3.297*
Education – upper secondary school	0.691	1.349	-1.446*	-0.059	-1.022	-1.035
Education – university	-28.461**	2.428	-0.994	0.263	-0.816	-2.394
Internet	-0.185	-0.595	0.106	0.545*	0.114	-1.068
Constant	-21.825**	-0.911	-1.512*	-2.056*	-0.738	0.604
Observations	277	199	1,097	859	532	230
chi ²	x	10,037.740**	76,855**	56,829*	68,445**	13,720.912**

Source: Author's calculations.

¹ Explanation: Factors with one or more asterisks make a significant positive (+) or negative (-) contribution to the probability of selecting the option "It never occurred to me" versus the base case "Other reasons." For example, respondents with university education were significantly less likely to choose the option "I never thought about comparing the fees of my current account." Therefore, if respondents with university education refrain from comparing prices, they are significantly more likely to do so for reasons other than a lack of awareness. Other reasons describe the cost-benefit ratio of price comparisons, i.e. potential savings are disproportionate to the time spent on comparisons.

Note: *** p<0.01, ** p<0.05, * p<0.1.

Table 5

Why Do Consumers Not Switch Suppliers?

	Food	Electric and electronic products	Checking account	Home insurance	Trades	Motor fuels
Factors influencing the probability of selecting the option "There are cheaper ..., but switching is too cumbersome" versus the base case "Switching activity"						
Income – low	0.243	0.064	-0.005	0.018	0.263	-0.130
Income – medium	-0.301	-0.580	-0.257	-0.082	-0.125	-0.302
Income – high	0.173	-0.534	-0.243	0.336	0.820*	0.029
Gender	0.056	-0.229	0.015	0.185	0.442*	0.347
Place of residence	-0.053	-0.630*	0.059	0.280*	0.077	-0.642*
Occupation – jobless	-0.936	-32.207**	0.301	0.368	-0.368	-0.077
Occupation – student	-0.499	-0.048	0.110	0.714*	-0.371	0.209
Occupation – retired	0.741**	0.518*	0.113	0.371*	0.247	0.446*
Occupation – home	0.450	0.721	0.379	0.297	0.966*	1.057*
Class – B	0.065	-0.356	0.326	0.831**	0.929*	0.218
Class – C	-0.327	-0.264	0.220	0.663*	0.628	0.013
Class – D	-0.125	-0.011	0.505	0.875*	0.122	0.148
Class – E	0.528	0.553	0.581	0.728*	0.312	0.218
Education – apprenticeship	-0.097	0.490	0.000	0.162	-0.708*	0.378
Education – vocational school	0.844*	1.110*	0.150	0.472*	-0.110	0.822*
Education – upper secondary school	0.693*	0.809*	0.149	0.251	0.077	1.422**
Education – university	0.493	0.178	0.107	0.541	-0.614	1.558**
Internet	0.075	-0.196	0.017	0.081	0.369	0.796**
Price comparison yes	-1.123**					
Price comparison yes		-0.916**				
Price comparison yes			-2.845**			
Price comparison yes				-2.834**		
Price comparison yes					-1.307**	
Price comparison yes						-1.558**
Constant	-1.702**	-1.903**	-0.349	-1.305**	-2.132**	-2.649**

Factors influencing the probability of selecting the option "Since I do not compare prices, I am not aware of any cheaper suppliers" versus the base case "Switching activity"

Income – low	-0.488	-0.053	1.931	-0.933	0.276	-0.003
Income – medium	-0.500	-0.429	1.175	-0.927	0.175	-0.067
Income – high	-0.216	-0.712	1.053	-1.572	0.335	-0.451
Gender	-0.169	0.130	0.610	-0.967	0.179	0.603*
Place of residence	0.861**	0.718**	-0.745	-1.371	0.622**	1.374**
Occupation – jobless	-0.339	-0.955	0.908	-31.280**	-0.230	-0.439
Occupation – student	-0.066	-1.193*	1.488	-32.376**	0.521	-0.879
Occupation – retired	0.038	-0.497	-1.194	-1.062	-0.138	0.778*
Occupation – home	0.337	-0.293	1.189	-32.254**	0.916*	0.405
Class – B	0.735	0.459	-1.849**	-2.285*	0.798*	-0.110
Class – C	0.342	0.392	-3.131**	-1.599	0.582	-0.437
Class – D	0.143	0.992	-4.437**	-1.987	0.650	-0.227
Class – E	0.725	1.327	-33.407**	-34.140**	0.581	-0.788
Education – apprenticeship	-0.253	-0.110	-1.635*	-1.728*	0.373	-0.268
Education – vocational school	0.118	0.050	-0.305	-32.893**	0.687*	-1.094*
Education – upper secondary school	-0.432	0.119	-1.899*	-1.769*	0.248	-0.311
Education – university	0.755	0.320	-2.443*	-2.309	-0.134	-0.618
Internet	0.405	0.599*	-0.605	-0.440	0.015	0.029
Price comparison yes	-2.818**					
Price comparison yes		-2.926**				
Price comparison yes			-0.498			
Price comparison yes				0.688		
Price comparison yes					-2.268**	
Price comparison yes						-4.301**
Constant	-1.932*	-2.189*	-1.350	-0.012	-2.401**	-1.294
Observations	1,817	1,680	1,849	1,645	1,448	1,540
chi ²	215.354**	24,262.976**	12,202.917**	8,081.316**	176.456**	235.166**

Source: Author's calculations.

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6

Switching Efforts

	Food	Electric and electronic products	Checking account	Home insurance	Trades	Electricity	Motor fuels	Mobile telephony
Income – low	-0.208	-0.001	-0.140	-0.271	-0.389*	-0.146	-0.115	-0.257
Income – medium	0.391*	0.460*	-0.296	-0.361*	-0.318	-0.465**	0.160	-0.231
Income – high	-0.277	0.193	0.109	-0.116	-0.074	-0.060	-0.371	0.000
Gender	0.188	0.216	0.186	0.218*	0.179	0.197	0.139	0.254**
Place of residence	-0.566***	-0.499***	0.572***	0.574***	0.350**	0.429***	-0.756***	-0.012
Occupation – jobless	-0.323	0.389	-0.555*	-0.737*	-1.291***	-0.565*	0.004	-0.069
Occupation – student	0.581**	0.754***	-0.283	0.136	-0.004	-0.015	0.778***	0.144
Occupation – retired	-0.378**	-0.451**	-0.147	-0.173	-0.404**	-0.114	-0.650***	0.193
Occupation – home	0.270	0.106	-0.149	-0.382	-0.675*	0.145	-0.209	0.205
Class – B	0.995**	0.648*	0.223	0.603**	0.398	0.070		
Class – C	1.064**	0.579	0.093	0.543*	0.551*	-0.024		
Class – D	1.672***	1.098**	0.033	0.554*	0.698*	-0.207		
Class – E	1.726***	1.313**	0.486	1.112***	0.910**	0.393		
Education – apprenticeship	0.563**	0.538**	-0.181	0.157	0.149	0.165	0.299	0.043
Education – vocational school	0.173	0.243	0.001	0.480**	0.052	0.441*	-0.408	-0.108
Education – upper secondary school	0.725**	0.654**	0.177	0.741***	0.657**	0.471**	0.698**	0.168
Education – university	0.844**	0.538	0.133	0.634**	0.398	0.249	0.227	0.429*
Internet	0.944***	1.082***	0.519***	0.401***	0.738***	0.528***	1.231***	0.685***
Price comparison yes	-0.894***							
Price comparison yes		-0.661***						
Price comparison yes			-0.444***					
Price comparison yes				-0.790***				
Price comparison yes					-0.232*			
Price comparison yes							-1.240***	
Constant	-2.874***	-2.752***	-0.020	-0.492	-1.444***	0.260	-1.390***	-0.414**
Observations	1,773	1,627	1,670	1,480	1,377	1,676	1,487	1,702

Source: Author's calculations

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Bank Recapitalization and Restructuring: An Economic Analysis of Various Options

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A financial crisis leads to a debt overhang in the banking sector and subsequently to a credit crunch. In most cases, it is not possible to remedy this situation without economic policy measures. In this study, we use a uniform framework to analyze how banks in a crisis situation can be restructured at minimum cost to the taxpayer in order to enable them to function again. We discuss various forms of intervention: measures which do not affect the rights of existing bank owners and creditors (guaranteeing prior debts, purchasing troubled assets, injecting equity) and measures that do (good bank/bad bank, debt-for-equity swap). Measures which minimize the costs to the taxpayer will necessarily affect the rights of existing owners and creditors, meaning that they also raise issues related to the reform of bank insolvency law.

JEL classification: G01, G2, G28, G33, G38, H0, H2, H81

Keywords: financial crisis, bank recapitalization policy, bank insolvency, financial regulation

In response to the international financial crisis, numerous governments adopted bank rescue packages in the fall of 2008. The purpose of those interventions was to recapitalize the banking system in order to prevent a (then) impending widespread collapse of financial intermediation. In combination with monetary and fiscal policy measures, these bailout packages achieved their goal; the banking system stabilized. Whether those measures were sufficient to restore the banks' ability to perform their central function – i.e. providing credit to the real economy – remains controversial (Ivashina and Scharfstein, 2010).

In addressing this problem, national legislators included different recapitalization measures in their bank rescue packages (Posch et al., 2009). But how can the various options be assessed and weighed against each other? Can they be ranked in any way? Might it be possible to make better choices in a future similar situation?

This study provides answers to those questions by examining different approaches to recapitalization within a uniform analytical framework. In conceptual terms, our analysis relies on a simplified bank balance sheet, the characteristics of debt and equity capital,

and the concept of incentive compatibility. The main advantage of such an abstract analysis is that it highlights key structural aspects of different recapitalization policies. This should make it possible to draw the right lessons from the crisis for future reference and to identify potential improvements in economic policy.

This study addresses two main questions: First, is it necessary to use taxpayer money in order to recapitalize the banking system? The second, closely related question is whether a reasonable recapitalization policy also calls for a reform of bank insolvency law.

Our analysis leads us to the following fundamental conclusions: In principle, it is possible to design a recapitalization policy which does not involve the use of tax funds. This option currently only exists in principle, as recapitalization policies that minimize the cost to taxpayers will necessarily affect the rights of bank owners and creditors. Avoiding the use of tax money thus requires a legal and institutional framework which goes beyond the scope of recapitalization policy and touches on issues related to bank insolvency law. Where it is mandatory that the rights of existing owners and debt

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lenders remain intact, tax funds must be used for bank recapitalization. We assessed the different intervention options in terms of effectiveness and ranked them according to the amount of government support they require.

1 Bank Recapitalization: The Problem of Debt Overhang and the Role of Economic Policy

Should recapitalizing the banking system even be a function of economic policy? It goes without saying that under normal circumstances, an undercapitalized bank should effect the necessary recapitalization on its own. If that is not possible, the bank must ultimately be allowed to fail. The question of what can happen with the failed bank in such a case and who can claim its assets is governed by bank insolvency law. The quality of this legal framework is a crucial factor for the economic and social costs of a bank insolvency. For reasons related to long-term incentives, it is necessary to ensure that banks are not recapitalized automatically. If banks cannot be allowed to fail, the situation encourages irresponsible behavior, excessive risk-taking and runaway expansionism; the number of crises will also rise, requiring increasingly dramatic and costly bailouts.

Economic policy-induced recapitalization can make sense in a systemic crisis, where one can expect a sweeping collapse of financial intermediation and the payment system. It may also be appropriate if a financial crisis brings about extremely high levels of debt in the banking system without leading to insolvency. In such a situation, it is not possible to finance valuable new projects because the payment obligations from existing debt are so high that the bank cannot actually profit from financing those projects. This means that socially valuable projects that

should be carried out for reasons of efficiency would not be realized because of a conflict of interests between investors. This situation is referred to as a debt overhang.

The economic literature discusses two types of debt overhang. The first variant is a direct result of limited liability. One example which illustrates the problem in a somewhat stylized manner is as follows: A bank holds a credit portfolio with a present value of 90 monetary units. The capital structure used to finance that portfolio comprises 86 units of debt capital and 4 units of equity. The risk assessment shows that there is a 50% probability that the credit portfolio will be worth 100 units and a 50% probability that it will be worth 80 units at the end of the period. In the upside case, the portfolio will be worth 100 units, and the bank can repay the debt in the amount of 86 units; for the sake of simplicity, we assume an interest rate of 0%. The equity investors will receive the remaining 14 units. In the downside scenario, the value of the credit portfolio will not be sufficient to repay the debt, and the bank will become insolvent. Assuming that bankruptcy proceedings are very simple and do not create additional costs, the creditors will receive the credit portfolio, which is valued at 80 units in this case. The equity investors will be left empty-handed. At the beginning of the period, the bank has the opportunity to grant another loan of 4 units which is certain to have a value of 5 units at the end of the period. As the present value of the loan is positive, from a general economic perspective it should be approved. However, the situation is rather different for the owners. At the start of the period, they would have to spend 4 units. In the upside case, they would receive 19 instead of 14 units, but in the downside

case, the value of the bank's loans would total 85 units – which is less than the bank's debt. The institution would go bankrupt, and all of the additional 5 units would benefit its creditors. For the bank's owners, the present value of the loan is negative: An investment of 4 would deliver an expected payoff of 2.5 units. For the debt lenders, on the other hand, the additional loan would be extremely lucrative, as they would see the value of the bank's debt capital rise by 2.5 units without investing their own funds.

Why can a competing financial institution not take advantage of this profitable opportunity? One reason frequently discussed in the literature is an information problem arising from the specific relationship between the bank and its customer (Greenbaum and Thakor, 1995). Thanks to its long-standing relationship with the potential borrower, bank A enjoys an information advantage; only the managers of bank A know that the loan will be worth 5 units at the end of its term. Procuring this information would be a tedious and cost-intensive process for the bank's competitors.

However, even if the new loan can only be granted by bank A, its owners and debt lenders could, in principle, resolve the situation through negotiations. The owners could offer to fund the loan if the debt lenders invest 2 units. Once again, an information problem arises: The investors do not know whether the information about the value of the loan at the end of the period is actually true. Moreover, there will generally not be just one creditor, but a large number of heterogeneous investors. If we assume that procuring information involves a relatively large proportion of fixed costs, a negotiated solution is highly improbable.

The equity investors of a bank with a positive probability of bankruptcy will base their decisions only on future scenarios in which the bank does not go bankrupt and in which they retain control over the bank. A potential debt overhang as a consequence of limited liability cannot be eliminated, but only mitigated. Furthermore, it is evident that there is no private-sector solution to the problem. If the objective is to restart lending, then economic policy intervention is necessary.

In the recent economic literature on bank recapitalization, two articles have dealt with debt overhang in the sense described above. Philippon and Schnabl (2009) provide an analysis of the costs of recapitalization. If banks are required to participate in the recapitalization program, the authors conclude that it is irrelevant whether the government takes direct equity stakes in banks, buys up risky assets or guarantees the banks' debts. All three measures create the same costs. If, on the other hand, participation in the program is voluntary and the private sector is better informed about the quality of the assets, then a direct equity investment is preferable. In such a case, the public sector faces a self-selection problem, as the banks with the lowest-quality assets will take part in the program. In this situation, a tradeoff exists between the benefits of financing desirable new projects and the adverse selection of banks with especially low asset quality. Philippon and Schnabl (2009) demonstrate that under asymmetric information, direct equity investment resolves this tradeoff more effectively than debt guarantees or the purchase of risky assets. Kocherlakota (2009), who assumes that the repayment of existing debts is at least implicitly guaranteed by the government, arrives at similar results. He argues that purchasing risky

securities and making a direct equity investment in the bank are equivalent options if the government is able to assess the quality of assets accurately. If, in contrast, the government has only incomplete information about the bank's assets, then direct equity investment is preferable.

The term *debt overhang* is also used in another context in the economic literature (Tirole, 2006). If equity investors are able to influence the probability of a project's success, they will only invest additional effort for that purpose if they are compensated with a higher return. Let us assume that a bank can grant a highly risky loan in the amount of 6 monetary units. The probability that the borrower will be able to repay 10 units at the end of the loan's term is 40%, while the probability of complete default is 60%. Under these circumstances, the loan has a negative present value and should not be approved. However, by monitoring the borrower, the bank owners can boost the probability of success to 90%. The costs of doing so amount to 2 units. In this case, the present value² of the loan is positive. Whether or not the borrower will be monitored depends on how much the bank owners receive in the case of success. Assume that the equity investors receive the amount R . If they decide to invest effort in monitoring, the expected return is $0.9 \cdot R - 2$. If they decide not to monitor the borrower, the expected return is $0.4 \cdot R$. The equity holders will therefore only make these efforts if their share of the return is at least 4 units. Potential debt investors know that a repayment of more than 6 units would create inappropriate incentives. The present value of a claim in the amount of 6 is 5.4, provided that the owners monitor the

loan carefully. Assuming that debt lenders are risk neutral and act under perfect competition, then 5.4 would be the maximum amount the bank could raise by issuing new debt. A debt overhang exists if the bank has less than 2.6 monetary units in equity, because the bank will not be able to raise the 8 units necessary to finance the loan and the monitoring infrastructure. This form of debt overhang likewise implies that new projects with a positive present value may not be financed.

Our study complements the work of Philippon and Schnabl (2009) and Kocherlakota (2009) by analyzing the costs of recapitalization measures when equity investors have the wrong incentives due to high levels of debt.

In practice, both forms of debt overhang are significant and can also be combined in theoretical analysis. In order to simplify our illustrations and to highlight the problem of incentives, we focus on the incentive view of the debt overhang problem.

In summary, specificity in intermediation knowledge as well as coordination and incentive problems may lead to a situation in which the only way to restore the functioning of a banking system is to develop a suitable recapitalization policy. Without such measures, banks' funding problems would imply the risk of a credit crunch regardless of the fact that new and profitable opportunities are available. In this case, neglecting to recapitalize banks would be inefficient.

2 Analytical Framework

In order to define an analytical framework in which various options can be discussed and compared, we use a simple, abstract model of a bank, its assets and capital structure as well as its own-

² Assuming an interest rate of 0% and risk-neutral investors.

ers' incentives. The model is derived from Tirole (2006) and stems from the literature on corporate finance. For the purposes of this discussion, we equate owners and management in order to focus on the decisive conflicts of interests among various investor groups and to separate our analysis from conflicts of interests between owners and management.

Analyzing various recapitalization options within an abstract framework instead of using examples from the recent past has the distinct advantage of allowing us to concentrate on conceptual elements. This approach is intended not to draw attention away from practical issues, but to maintain the focus on key aspects.

A bank is considered at two points in time: today ($t=0$) and tomorrow ($t=1$). Today the bank has assets valued at A and existing debt of D . The bank currently has the opportunity to grant a new loan in the amount of x . The loan is risky and will be worth either v or 0 tomorrow. Only the assets in excess of D can be liquidated or pledged to finance the project. The remaining funds necessary to make the loan must be derived from external sources of funding.

We assume that the bank's existing debts cannot be renegotiated ex post. The potential borrower can only take the loan out from this bank because it enjoys an information advantage over other banks and the capital market. The investors and equity investors are risk neutral, and the interest rate is 0%.

The level of risk associated with the new loan also depends on the behavior of the bank's owners. This is where the incentive problem comes into play: If the bank's owners ensure that the potential borrower is monitored diligently, then there is a probability of π_H that the borrower will repay the value v .

The costs arising from diligent monitoring amount to m . Assuming that $\pi_H v$ is greater than $x + m$, the loan has a positive present value. If the bank's owners opt not to monitor the borrower, the probability of repayment drops to $\pi_L < \pi_H$. The costs thus eliminated – i.e. m – are paid out as a dividend immediately at $t=0$. In this case, the present value of the loan is assumed to be negative ($\pi_L v < x$).

From the perspective of the potential investors financing the new loan, it is important to ensure that the bank has the right incentive to monitor the loan diligently. Assuming that the bank receives R_B , the expected return for the bank's owners in the case of diligent monitoring must be at least as high as it would be in the absence of such monitoring. The incentive condition $\pi_H R_B \geq \pi_L R_B + m$ must be fulfilled. The owners will only make efforts to monitor the borrower if they receive a sufficient share of the return in the case of success. Therefore, R_B must be at least equal to $\bar{R} = m / (\pi_H - \pi_L)$.

Given a promised repayment of R_I , competitive investors will be willing to finance the amount l if they can cover their costs with the expected value. We assume that the existing debt D has to be serviced before all other debts due to contractual seniority agreements. In order to ensure repayment, only that part of assets which exceeds D is pledged or sold in order to finance the new project. As a consequence, the new investors will only receive the promised repayment if the project is successful. The condition on which investors are willing to fund the new loan is thus $l = \pi_H R_I$.

The maximum amount which can be paid out to the investors in the case of success without violating the owners' incentive condition is limited by $v - \bar{R}$. As a result, the amount that can be

funded by issuing fresh debt is limited to $\bar{l} = \pi_H(v - \bar{R})$. If we assume that the investment volume $(x + m)$ exceeds the sum of available assets $(A - D)$ plus the maximum amount of debt capital which can be raised (\bar{l}), the bank suffers from a debt overhang and cannot grant profitable new loans without renegotiating with its existing creditors. The crux of the problem lies in the fact that such renegotiations are difficult, in many cases even impracticable. Without economic policy measures, valuable investment opportunities will be neglected. The consequence is a credit crunch.

The discussion of the analytical framework above already yields two perspectives on how to design recapitalization policy to eliminate a debt overhang. If the policy must leave the claims of existing creditors (D) unchanged, injecting external capital is the only option to shore up the bank's equity to such an extent that the bank can satisfy its existing debt obligations while at the same time allowing it to finance the new project. Another option might be to create a framework which enables the bank to realize the project and divide the resulting profits among its various investors. This approach resembles insolvency proceedings in that it forces existing creditors to forgive enough debt in order to make it profitable for investors to fund the new and desirable loan.

3 Analysis of Various Options

3.1 Measures without Effects on Existing Rights

3.1.1 Guaranteeing New Debt Issues

If the government guarantees the repayment of newly issued debt, then investors will obviously be willing to provide the bank with debt capital in

excess of \bar{l} . While this guarantee ensures that the new loan can be funded, it does not resolve the bank's incentive problem. As the owners receive too small a share of the profits, they will agree to grant the new loan but not monitor the borrower closely, opting instead to pay out those costs (i.e. m) as a dividend. This problem is exacerbated if the government demands a premium for the guarantee. Issuing guaranteed new debt will solve the debt overhang problem only if the government is able (through its regulatory authorities) to force the bank to monitor the new loan closely.³

3.1.2 Guaranteeing Existing Debt

A similar picture emerges when the government provides a guarantee for the repayment of a bank's prior debt, thus allowing the bank to use a larger share of its existing assets to fund the new loan. In this case, it is also in the bank's interest to approve the new loan and to fund it by selling a share of the bank's assets, specifically $\alpha A > A - D$. If the new loan is not repaid, the government will reimburse the prior creditors for the loss in the amount of $D - (1 - \alpha)A$. If the new loan is repaid, then part of v must be used to repay the bank's older liabilities, so that the bank's owners do not receive the entire value v . If the bank is heavily indebted, i.e. $A - D < x + m - (v - \bar{R})$,⁴ the incentive condition will be violated: The owners will grant the loan, but they will decide against monitoring. In cases where the bank's debt is lower, i.e. $x + m - (v - \bar{R}) \leq A - D$, the incentive problem is resolved. The expected costs of the government guarantee come to $c_0 = (1 - \pi_H)(x + m - (A - D))$.

³ Guarantees for new debt issues can be useful and effective when liquidity conditions are tight, but they cannot actually resolve the problem of a debt overhang.

⁴ This condition is stricter than in the case of a debt overhang.

3.1.3 Purchasing Troubled Assets

What triggered the debt overhang in the first place was the fact that banks had to take severe losses on the asset side of their balance sheets as a result of the crisis. Many argued that those losses in value resulted from panic on the financial markets and not from a change in fundamental data. Therefore, by buying up non-performing securities, the government could not only restructure the banks but also earn profits. However, those assessments remain speculative and hardly form a suitable basis for sound economic policy decisions. Taking a conservative view, we should assume that the loss of value has actually occurred.

In this model, we postulate that A is actually the correct value of the assets. In order for the new loan to be approved, it is necessary to compensate for the difference between the available funds ($A-D$ and \bar{I}) and the required funds ($x+m$) by means of a deliberate overpayment on the assets. The price to be paid is not determined by the potential future value of the assets, but by the extent of the bank's overindebtedness. The government thus has to pay a premium of $c_i = x+m - (A-D) - \pi_H(v-\bar{R})$. The costs incurred are lower than those of a government guarantee for the bank's existing debts ($c_i \leq c_0$).

3.1.4 Increasing Equity Using Tax Funds

Apart from restructuring the bank's assets or issuing new debt, the government may also opt to increase the bank's equity. The proceeds from this equity issue, E_i , have to be high enough to finance the new loan ($x+m = E_i + (A-D)$). In return, the investors receive a share (α) of the bank's value with a present value of $\pi_H \alpha v$. New shares will find a ready market if their present

value is at least equal to the issue price, that is, $E_i \leq \pi_H \alpha v$ or $\alpha \geq E_i / (\pi_H v)$.

Whether or not the capital increase eliminates the debt overhang depends on who bears the costs of diligent monitoring. If the costs of monitoring can be avoided and instead paid out as a special dividend to the existing owners, the capital increase will be limited to $E_i \leq \bar{I}$. In this case, the new loan cannot be funded. A different situation arises if the costs of diligent monitoring (m) have to be paid out in proportion to the shares. The existing owners will ensure that the loan is monitored if $\pi_H(1-\alpha)v \geq \pi_L(1-\alpha)v + (1-\alpha)m$ or $(\pi_H - \pi_L)v \geq m$. The incentive condition is fulfilled in this case. Another question is whether α can be defined in such a way that a sufficient amount of new equity is available on the one hand, i.e. $\pi_H \alpha v \geq x+m - (A-D)$, and that the loan is profitable for the existing owners on the other, i.e. $\pi_H(1-\alpha)v \geq A-D$. This is the case for

$$\alpha \in \left[\frac{x+m}{\pi_H v} - \frac{A-D}{\pi_H v}, 1 - \frac{A-D}{\pi_H v} \right]$$

Any value of α within this interval is permissible. The division of claims in proportion to capital contributions, $\alpha^* = E_i / (E_i + A-D)$, which is regarded as fair, also lies within this range. Therefore, a private-sector solution to the debt overhang problem is possible if the costs of monitoring m are not distributed as a dividend to the existing owners, if the new investors are not subject to an information disadvantage, and if the existing owners accept a reduction of their voting rights. Finally, it must also be possible to negotiate α successfully at $t=0$. This analysis explains why equity increases were observed occasionally during the crisis but were generally difficult to attain. An equity increase in the form of participation capital does not dilute the existing

shareholders' voting rights and will therefore be accepted more readily.

3.2 Measures with Effects on Existing Rights

The measures described above leave the rights of existing creditors and owners intact. Abandoning this imperative opens up a number of additional intervention opportunities, including separation into a "good bank" and a "bad bank" as well as compulsory debt-for-equity swaps. However, because they affect the rights of the existing owners and creditors, these measures resemble insolvency proceedings and thus go beyond the narrower scope of recapitalization policy.

3.2.1 Good Bank/Bad Bank

Good bank and bad bank were popular buzzwords in 2009. However, one point was often overlooked in this discussion: In terms of regulatory policy, there is a questionable and a sensible way to divide up a bank. These two options are referred to as the "bad bank solution" and the "good bank solution" below. While the former leaves existing rights intact and uses the taxpayers' money to recapitalize the bank, the latter manages to avoid using tax funds for that purpose.

In its simplest form, the bad bank solution involves splitting up the asset side of the bank's balance sheet into two categories. The impaired parts (A_1) are carved out, and together with the old debts (D) they are allocated to a newly established "bad bank" known as bank B. The other assets, $A_2 = A - A_1$, remain on the balance sheet of the old – and now good – bank A. In order to eliminate the problem of overindebtedness, the good bank must have sufficient equity, that is, $A_2 \geq x + m - \bar{l}$. This implies that without government support, bank B would have negative eq-

uity ($A_1 < D$). The separation of assets thus has to be subsidized, and the costs equal those incurred in the direct purchase of the troubled assets. In this way, the problem of overindebtedness is resolved.

However, the owners of bank B – generally the government – and its creditors bear the risk of any further changes in the value of A_1 . From a regulatory standpoint, this is a questionable solution.

Hall and Woodward (2009) present an approach which obviates this problem. They propose that bad bank B should also receive the ownership rights to good bank A. The prior owners therefore own bank B directly and bank A only indirectly. The advantage of this solution is that any changes in the value of A_1 still benefit – or still have to be borne by – the original investors.

Bank A is funded exclusively by equity. Let us assume that the value of its assets, A_2 , is high enough that it can be used – together with debt capital in the amount of \bar{l} – to fund the new loan, that is, $(A_2 + \bar{l} = x + m)$. If the managers of bank A maximize the value of the equity held by the creditors and owners of bank B, the incentive condition is clearly fulfilled. The loan will be granted and monitored diligently. However, if the shareholders of bank B – who hold all of the voting rights in bank A – succeed in having bank A pay out the cost savings (m) to bank B at $t=0$ and having bank B distribute them immediately in the form of a dividend, the incentive condition is violated. In that case, the new loan cannot be financed because the debt lenders would not be willing to invest \bar{l} . The problem of overindebtedness is resolved once it seems certain that bank A's management will maximize the value of equity or bank B's shareholders

will not demand the immediate distribution of dividends.

The bank's restructuring leads to a situation in which the originally senior claims of prior creditors are now satisfied only once bank A has repaid its new debt. The beneficiaries of the good bank solution are the taxpayers and the prior owners, while the losers are the prior creditors, whose claims are curtailed ex-post.

3.2.2 Debt-for-Equity Swaps

A debt-for-equity swap refers to the forced conversion of debt into equity.⁵ In contrast to conventional insolvency proceedings, this measure can be implemented within a very short period of time without interrupting the bank's ongoing operations. In the simple model presented here, a debt-for-equity swap involves reducing the claims of existing debt holders from D to D^* . In exchange, they receive a share α of the new equity, i.e. $A - D^*$. If the management acts in the interest of the prior owners – which is equivalent to the assumption in the model that m can be distributed to them in its entirety – then the debt-for-equity swap generates a present value loss for the creditors in the amount of $x + m - (A - D) - \bar{I}$, regardless of how D^* is defined. The forced conversion of debt into equity can be regarded as an effective disciplinary measure. If a bank's creditors know that a debt-for-equity swap will lead to a loss of value in the case of overindebtedness, they will not be willing to finance such a high debt-to-equity ratio ex ante.

If the managers maximize the value of equity, a share (α) of which is held by the prior creditors after the restructur-

ing, the incentive condition is fulfilled. As the new loan has a positive present value, it is possible to compensate the prior creditors for waiving their claims. In this case, the debt-for-equity swap acts as an institutionalized renegotiation mechanism.

This form of swap can be designed in two ways: On the one hand, legislation may require the bank to hold a certain volume of convertible capital (hybrid capital). On the other hand, the law may provide for the forced conversion of debt into equity in the event of a crisis.⁶

3.3 Can These Measures Be Ranked?

Our analysis enables us to rank the various forms of intervention, as most measures are capable of resolving the debt overhang problem, but they involve different costs.

Provided that existing rights must remain intact, an equity injection is the most favorable option for the taxpayer. Purchasing risky assets is the second best solution, while debt guarantees are either ineffective or comparatively expensive.

If it is possible to change existing rights, the costs of recapitalization have to be borne by the existing creditors. In such cases, the good bank solution and debt-for-equity swaps are equivalent options.

4 Recapitalization Policy and Bank Insolvency Law

Our analysis of various recapitalization options has shown that possible courses of action can essentially be assigned to two categories: measures that leave existing rights intact and measures that do not. This is where the discussions of

⁵ This approach was advocated most prominently by Zingales (2009).

⁶ Lloyds Banking Group issued such a convertible bond under the designation "contingent capital" in 2009. Kashyap et al. (2008) use the same term to denote a form of insurance payoff in the event of a crisis.

recapitalization policy and bank insolvency law intersect. Procedures which affect the rights of creditors are equivalent to insolvency proceedings or a bankruptcy regime in so far as they serve to redefine who has a claim to the bank's assets. Depending on the leeway given to prior shareholders in determining the future use of assets, such a procedure may be tantamount to insolvency proceedings.

The legal framework governing how to deal with banks facing financial difficulty could thus be improved by creating special bank insolvency legislation as an instrument available in parallel to government recapitalization measures.

Birchler and Egli (2003) propose bank-specific insolvency legislation which makes it possible to deal with a debt overhang and insolvency within a single legal framework. Their proposal was used as the basis for the reform of bank insolvency law in Switzerland. Under this framework, insolvency proceedings can be initiated by the regulatory authority, and the asset and liability sides of the bank's balance sheet are treated separately in the process. The liability side is homogenized by converting debt into equity. The conversion process is designed in such a way that seniority levels are maintained and outsiders also have the opportunity to invest in the bank. During the process, the existing management continues to administer the bank's assets under the supervision of the regulator. At the same time, the bank is put up for sale, and interested parties are allowed to submit bids for the entire bank or specific parts of the bank. The new owners of the bank after the restructuring process decide which offer is accepted.

From an economic perspective, this approach has three key advantages: First, the decision on the future of the

bank is made by the parties affected, namely the creditors and interested new investors. Second, the homogenization of the liability side ensures that interests are aligned, thus creating a uniform incentive to maximize the value of the bank. Third, the procedure can be completed quickly and therefore reduces systemic risk and procedural costs.

Our analysis shows that effective and up-to-date bank insolvency legislation would make it possible to handle both insolvency and undercapitalization within a single framework without requiring tax money to remedy those problems. Therefore, developing and discussing suitable legal reforms in this area would be a worthwhile project for the future. Such a reform would also make it possible to allow more latitude for market discipline. Moreover, the public sector would be relieved of two burdens: For one, such a framework would lower the pressure to create increasingly complicated regulations in the banking sector. At the same time, it would ensure that the public sector commands far more bargaining power in future crises than it currently has.

5 Conclusions

In a situation where a debt overhang exists in the banking system, it is necessary to be able to take recapitalization measures. Despite potential gains in efficiency, a private-sector solution to the problem usually cannot be attained due to information problems and conflicts of interests. If it is not possible to effect recapitalization of the banking system, the system runs the risk of a funding shortage and a resulting credit crunch. The macroeconomic consequences of that will lower the quality of assets even further and exacerbate the debt overhang problem, thus creating a negative feedback spiral.

In principle, economic policymakers can address a debt overhang in two different ways: First, they can introduce special legislation to allocate tax funds for the purpose of recapitalization during a crisis. Possible measures in this category include equity increases, the purchase of troubled assets, and guarantees for old and new debt. In line with the work of Philippon and Schnabl (2009) and Kocherlakota (2009), this study comes to the conclusion that an equity increase is an effective form of intervention which minimizes the burden on taxpayers. If banks are bailed out by means of special legislation, the danger arises that recapitalization measures will also be expected in the future. If those expectations become firmly established, we can no longer expect banks to be disciplined by debt holders.

The alternative to special legislation for such events would be a reform of

bank insolvency law that allows the competent regulatory authority to initiate a restructuring procedure once a bank reaches a certain undercapitalization threshold. The core objective of this approach would be to reduce prior claims to such an extent that the bank is able to resume lending for profitable new projects. This type of measure (unlike the special legislation approach) relies on rules and market discipline. Options include the good bank model as well as regulations which enable debt reductions and debt-for-equity swaps. This form of recapitalization does not require tax money. The creditors may have to take losses in assets, and one can expect the cost of debt capital to increase as a result, especially when debt-to-equity ratios reach levels at which recapitalization measures become probable. However, this effect may be entirely desirable as a control mechanism to limit risk.

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In recent years, the finance industry created numerous innovations with the intention of diversifying risk and making investments safer. On the occasion of receiving the Schumpeter Prize of the Schumpeter Society in Vienna on January 20, 2010, Barry Eichengreen reflected on what Joseph A. Schumpeter might have thought of the current crisis. This contribution presents his remarks made on the occasion of the award.

The Crisis in Financial Innovation

Barry Eichengreen¹

It is a great honor to receive this prize from the International Schumpeter Society. It is especially an honor to receive it in Vienna, the European capital where Schumpeter received the education that was central to his intellectual development. I have had a few occasions over the years to enjoy the hospitality of the Austrian central bank and the University of Vienna. It is always a pleasure to be back in this exceptional city.

My own points of contact with Joseph Schumpeter are necessarily indirect. My dissertation supervisor at Yale, the economist and economic historian William Parker, had taken Schumpeter's course at Harvard.² Bill always insisted that he was a disciple of Schumpeter's colleague, Abbot Peyton Usher, himself a specialist in the history of technology. But Bill also being an aspiring historian of technology, it is hard to imagine that he could have avoided Schumpeter's influence. Schumpeter's books were prominent on Parker's reading lists and on the shelves of his library at 28 Hillhouse Avenue. I also spent seven years as a young professor of economics at Harvard, where I resided in Littauer Center, the building where Schumpeter famously had an office. Actually, he had a suite of two offices, one being insufficient to house all his books. It may or may not be a coincidence that I also

have a suite of two offices, for the same reason, in Evans Hall.

At Berkeley, my connection with Schumpeter is my emeritus colleague, the eminent labor economist Lloyd Ulman. Lloyd was a graduate student at Harvard after World War II, and even now he describes Schumpeter's lectures and seminars like they were only yesterday. He describes Schumpeter's close connection with his students, to whom he referred as "my babies." I am not sure that graduate students today would react well to this form of address. But the time and effort that Schumpeter devoted to getting future members of the economics profession to think broadly is an example that more of us should emulate.

The importance of thinking broadly when engaged in research in the social sciences – to bring to bear on economics elements from sociology, political science, and history – is a hallmark of Schumpeter's work. Recent events – the financial crisis and the Great Recession – underscore the importance of the point. More generally, this is an especially appropriate time to reflect on Schumpeter's contributions to economics and how he arrived at them. One's work, Schumpeter emphasized, is a reflection of one's social milieu (a point to which I will return). And the period through which we are passing is marked by just the kind of extraordi-

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² If you read Tom McGraw's biography of Schumpeter, you will see a photo on p. 472 of Schumpeter in 1950 presenting a paper at the Harvard Center for Research on Entrepreneurial History with what appears to be a young William Parker in the background.

nary economic and financial crisis that characterized the decades when Schumpeter himself did his most important work. It is interesting to speculate about what Schumpeter would have thought of our crisis.

No doubt, he would have been of the view that the crisis was rooted in earlier excesses. He appreciated the limits to rational decision making and the tendency to engage in herd behavior, and therefore the propensity for markets to boom and bust. He understood these tendencies in terms similar to those of present-day economists specializing in behavioral economics and the economics of information. He understood how easy credit can combine with new technologies to produce an unsustainable boom followed by a disruptive crash: His favorite examples (from the history of my country) were the railway boom of the 19th century and the haphazard growth of the motor vehicle industry in the 20th. The boom financed by easy credit had the benefit of allowing more extensive experimentation with the commercialization of these new technologies than would have occurred in its absence. The bust then weeded out the failed projects and unsuccessful entrepreneurs. These dynamics were intrinsic to the operation of the capitalist system.

In other words, Schumpeter was something of a liquidationist. Not to the extent of Treasury Secretary Andrew Mellon, who famously defended the cleansing effect of the Depression by urging President Hoover to “liquidate labor, liquidate stocks, liquidate the farmers, liquidate real estate.... purge the rottenness out of the system.” But he did see downturns as correcting earlier mistakes and thus as having a cleansing function. He was conscious

that corners had been cut and laws had been broken in the pursuit of quick profits in the 1920s. He thus regarded the decline in stock values and the initial stages of the 1929/1930 downturn as “for moral reasons a most sanitary thing.”

But he also saw the need for government intervention to prevent the process from leading to the breakdown of the economic and financial system. The downturn of 1929 to 1932 in the United States, he insisted, remained an unexceptional recession with mainly constructive, cleansing effects until it was allowed to infect the banking system and spawn a full-blown financial crisis. That said, he was skeptical about Keynesian policies.³ He was, of course, a skeptic of all things Keynesian, given his self-conscious competition with Keynes for the mantle of greatest economist of the 20th century. Were he alive today, I suspect that Schumpeter would argue that we made the wrong choice in the last couple of years by relying so heavily on Keynesian pump priming while not doing enough to fix our broken banking systems, through recapitalization and, where necessary, temporary nationalization. A sound and stable financial system that can efficiently allocate investible funds and not just a certain level of aggregate spending, he would have argued, is required for economic stability and, importantly, for the innovation that incubates technological progress. Propping up demand while leaving the banks weak will make for a credit-less, innovation-poor recovery. Moreover, propping up demand will allow the banks to stagger on – this of course having been the express purpose of policy in the United States – in turn allowing many of the same bank CEOs who played a role in

³ See for example the third of the Lowell Lectures that Schumpeter delivered in Boston in 1941.

fomenting the crisis to remain in place. So much for the cleansing effect of the downturn.

I see some merit to this line of argument, although I do not buy it entirely. In particular, I think that cleansing the financial system of excesses at the cost of double digit unemployment is too high a price. We have seen in the recent crisis, and we have seen from research on the 1930s, that Keynesian policies can work (Almunia et al., 2009). I would have liked to see more Keynesian stimulus this time, not less, given how unemployment has risen more than expected. But I also would have liked to see stronger action by governments to fix broken banking systems, including temporary nationalization where necessary. Then and only then, once recovery was underway, I would have liked to see policy actions to throw out incompetent bank management, reform perverse compensation practices, and otherwise strengthen incentives for sensible behavior in financial markets. Of course, whether those responsible for policy in a democracy are capable of this kind of rational, time consistent action is another question about which Schumpeter would have raised doubts.

It is also interesting to ask what Schumpeter would have thought of the role of financial innovation in the crisis. He was of course a firm believer in the merits of financial innovation and development. He emphasized the role of finance in capitalist dynamics. His very definition of capitalism was “innovation financed by credit.” He insisted that many of the most important technological and commercial innovations of the 19th and 20th centuries would have been impossible without financial innovations like the joint stock company and limited liability.

But one wonders what he would have thought of collateralized debt obli-

gations and credit default swaps. As you know, there is now – how should I put it politely – a “spirited” debate about whether recent financial innovations have any positive social value, or whether they have simply been weapons of mass financial destruction. On the one hand, there is the presumption in the markets and in policy circles – given the importance of lobbying, one might ask whether or not they are different things – that financial innovation has been and continues to be a good thing, and that heavy-handed regulation which interferes with it would have higher costs than benefits. As President Obama put it in a speech in Philadelphia on September 14, 2009, we must guard against financial reforms and new regulations that “stifle innovation and enterprise.”

On the other hand, there is the view that the main purpose of recent financial innovations has been to facilitate regulatory arbitrage by shifting off balance sheet investments that would be more costly were they held on balance sheet, making it necessary to hold capital against them and provision against losses. The main purpose of financial innovation has not been to provide more efficient diversification of risk, so that a given amount of risk can be held more safely, but to shift that risk to naïve investors who do not know what they are holding (perhaps because they take the press releases of the rating agencies at face value) and to investors who are confident of being bailed out if things go wrong. The main purpose of financial innovation has been to give banks new instruments, like hidden fees on credit cards and negative amortization mortgages, that allow them to profit at the expense of unsophisticated individuals and households. You may say that I am offering a caricature of this view, but reputable figures such as

Paul Volcker assert that the only socially valuable financial innovation of the last 30 years is the automatic teller machine.

Personally, I would distinguish between financial innovation itself and the willy-nilly manner in which we have permitted innovations to be used. I continue to believe that many financial innovations, including more complex financial instruments, are in principle good. They can be used to shift risk to those best able to hold it. They can provide insurance for those with limited risk-bearing capacity. They can reduce financing costs for those engaged in production, investment and innovation. But given the number of unsophisticated users in the marketplace and the extent of asymmetric information, nothing ensures that a specific innovation will have these positive effects.

A popular analogy is pharmaceuticals. Modern biological science in the harness of the pharmaceutical industry holds out the promise of progress on some of our most difficult diseases. But it also can be abused, given the incentive of producers to rush products to the market and less-than-complete information on the part of consumers. How therapeutic drugs are used is therefore not left up to the individual. Pharmaceuticals are regulated; in many cases the individual must first get a prescription from a qualified professional (think of the doctor as the equivalent of the licensed financial analyst). Because of the complexity of the instrument and how quickly the technology changes, the qualified professional works under restrictions laid down by a board of experts (think of how new drugs have to be licensed before they can be prescribed), who give their approval to dispensing a new drug only after a vigorous program of testing.

Given the complexity of modern financial instruments and the extent of asymmetric information, it seems obvious that we should do for financial products what we do for pharmaceuticals. We are moving in that direction in the United States, at least provisionally, with the inclusion of a provision to create a Consumer Financial Products Safety Commission in the recent financial reform bill voted out of the House Banking Committee. Whether this will come to pass and, if so, how vigorously we will enforce the presumption that safety must be documented before a new product can enter the marketplace, only time will tell.

In this light, it is less than reassuring that we fell down so disastrously on the regulatory job in recent years. How would Schumpeter have understood this failure? I suspect that he would have pointed to excessive confidence in the ability of social scientists to capture the uncertainties of economic life using mathematical tools. Schumpeter spent his early life pursuing what he called “an exact economics” – economics in which complex problems could be specified in mathematical terms and analyzed using tools like the calculus. This of course turned out to be a quixotic effort, on Schumpeter’s part and more generally. But it did not prevent financial engineers from embracing mathematical tools and applying them in the form of concepts like Value at Risk. This gave the masters of the universe confidence, false confidence in the event, that they were capable of reducing economic and financial uncertainties to mathematical formulae and of managing their consequences. So long as things went well, those utilizing the technique were well compensated. The technique was implemented more widely. More business school students were trained in its use. Meanwhile, the

fact that the structure of the market can change and that uncertainty, unlike risk, cannot be captured by a simple set of mathematical formulas was out of sight, out of mind. The older Schumpeter of course abandoned his quest for an exact economics in favor of a more sociological approach. The problem for financial stability, one supposes, is that there is always a new generation entering the market (and the academic world) naively confident in the power of technique and less than appreciative of the importance of the social context.

Schumpeter would no doubt have also emphasized the role of ideology in shaping views of regulation. Looking back, one cannot help but be impressed by the role of deregulationist ideology, especially in the U.S.A. and the U.K. in the wake of the Reagan and Thatcher governments, in setting the stage for the subsequent crisis. The idea that markets, left to their own devices, get it right and that governments, when they intervene, can only get it wrong became deeply ingrained in intellectual and policy discourse. The idea that we should move in the direction of light-touch regulation of financial markets and institutions, where banks are relied on to manage their risks using their own internal models (along with the ratings they purchase on the securities they issue) reflected this ideology. So did policies under the Bush administration to starve the regulators of the financial and human resources needed to do their jobs. That we may now be turning back in the other direction reminds us that crises can weaken even deeply ingrained ideological presumptions, but at what price?

Schumpeter in his later years was sensitive to the role of ideology in scholarly and policy analysis. This was the theme of his 1948 presidential address to the American Economic Association

entitled “Science and Ideology.” In it, he emphasized that where you stand depends on where you sit – that an individual’s outlook is fundamentally colored by his personal and cultural background – in a bow to Marx, by his “class affiliations” as Schumpeter put it. This is more of a problem in the social sciences than in mathematics and physics, Schumpeter concluded, for whom “all falling stones look alike.”

Some natural scientists would dispute this. But they would not dispute Schumpeter’s final point, that when ideological biases gain currency in scholarly and policy debate, they tend to become reinforcing. When other banks, in boom times, are making gobs of money originating collateralized debt obligations and using CDS to insure them, the ideological bases for these practices provide further justification for the activity. When other banks are investing larger and larger shares of their funds in high-yielding investments and holding less as capital because their internal models of Value at Risk tell them that a small capital cushion will suffice, the argument that modern bankers, having mastered the science of risk management, should go along with these practices becomes irresistible. To be sure, other factors, like compensation practices that made it obscenely profitable for those taking the key decisions to go along, played a role in the process. But without a self-reinforcing ideology, it is hard to imagine that the privatization of risk management and the excessive risk taking that resulted in our current crisis could have proceeded as far as they did.

What was Schumpeter’s solution to this problem? In “Science and Ideology” he recommended an economics better informed by the analysis of actual historical events and processes, as opposed to the building of time- and place-in-

variant mathematical models.⁴ It was not that economic historians are less subject to ideological biases – after all, we have social origins too – but that we are more aware of the existence of such biases because we are in the business of analyzing social origins and their consequences.

While the crisis has been bad for the reputation of mainstream macroeconomics, it has been a good crisis for economic history. The case for economic history as now conventionally made is that financial market participants and policy makers should study history so that they are able to look beyond recent events. Knowledge of history will serve as a caution that when an asset class is booming that boom will last forever. History will remind them

that what goes up can come down. This is history as a corrective to the “this time is different” fallacy (as in Reinhart and Rogoff, 2009).

I would argue the role of history is more than just this. It reminds us that modeling choices are not independent of the social milieu of the modeler. And it is a reminder that social processes, including economic and financial processes, are complex and nonlinear in ways that can render counterproductive and dangerous efforts to reduce them to simple formulae that float in their own mathematical ether, suspended above social and political processes. It reminds us that it can be equally counterproductive and dangerous to make policy on that basis.

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⁴ And as he wrote in his *History of Economic Analysis* (1954, p.13), “...most of the fundamental errors currently committed in economic analysis are due to lack of historical experience more than any other shortcoming of the economist’s equipment.”

Notes

Abbreviations

A-SIT	Secure Information Technology Center – Austria	IHS	Institut für Höhere Studien und Wissenschaftliche Forschung – Institute for Advanced Studies, Vienna
ASVG	Allgemeines Sozialversicherungsgesetz – General Social Security Act	IIF	Institute of International Finance
A-Trust	A-Trust Gesellschaft für Sicherheitssysteme im elektronischen Datenverkehr GmbH (accredited certification service provider)	IIP	international investment position
ATX	Austrian Traded Index	IMF	International Monetary Fund
BCBS	Basel Committee on Banking Supervision (BIS)	ISO	International Organization for Standardization
BIC	Bank Identifier Code	IWI	Industriewissenschaftliches Institut – Austrian Institute for Industrial Research, Vienna
BIS	Bank for International Settlements	JVI	Joint Vienna Institute
BOP	balance of payments	LIBOR	London Interbank Offered Rate
BSC	Banking Supervision Committee (ESCB)	M3	broad monetary aggregate M3
CACs	collective action clauses	MFI	monetary financial institution
CEBS	Committee of European Banking Supervisors (EU)	MRO	main refinancing operation
CEE	Central and Eastern Europe	MoU	memorandum of understanding
CEEC(s)	Central and Eastern European country (countries)	NACE	Statistical Classification of Economic Activities in the European Community
CESEE	Central, Eastern and Southeastern Europe	NCB	national central bank
CESR	Committee of European Securities Regulators	OeBS	Oesterreichische Banknoten- und Sicherheitsdruck GmbH (Austrian banknote and security printing works)
CIS	Commonwealth of Independent States	OECD	Organisation for Economic Co-operation and Development
CPI	consumer price index	OeKB	Oesterreichische Kontrollbank (Austria's main financial and information service provider for the export industry and the capital market)
EBA	Euro Banking Association	OeNB	Oesterreichische Nationalbank (Austria's central bank)
EBRD	European Bank for Reconstruction and Development	OPEC	Organization of the Petroleum Exporting Countries
EC	European Community	ÖBFA	Österreichische Bundesfinanzierungsagentur – Austrian Federal Financing Agency
ECB	European Central Bank	ÖNACE	Austrian Statistical Classification of Economic Activities
Ecofin	Economic and Financial Affairs Council (EU)	POS	point of sale
EEA	European Economic Area	PRGF	Poverty Reduction and Growth Facility (IMF)
EFC	Economic and Financial Committee (EU)	R&D	Research & Development
EIB	European Investment Bank	RTGS	Real-Time Gross Settlement
EMS	European Monetary System	SDR	Special Drawing Right (IMF)
EMU	Economic and Monetary Union	SDRM	Sovereign Debt Restructuring Mechanism (IMF)
EONIA	Euro OverNight Index Average	SEPA	Single Euro Payments Area
ERM II	exchange rate mechanism II (EU)	SPF	Survey of Professional Forecasters
ERP	European Recovery Program	STEP2	Straight-Through Euro Processing system provided by the Euro Banking Association
ESA	European System of Accounts	STUZZA	Studiengesellschaft für Zusammenarbeit im Zahlungsverkehr G.m.b.H. – Austrian Society for Payment System Research and Cooperation
ESAF	Enhanced Structural Adjustment Facility (IMF)	S.W.I.F.T.	Society for Worldwide Interbank Financial Telecommunication
ESCB	European System of Central Banks	TARGET	Trans-European Automated Real-time Gross settlement Express Transfer
ESRI	Economic and Social Research Institute, Dublin	Treaty	Treaty establishing the European Community
EU	European Union	UCIT(s)	undertaking(s) for collective investment in transferable securities
EURIBOR	Euro Interbank Offered Rate	ULC	unit labor cost
Eurostat	Statistical Office of the European Communities	UN	United Nations Organization
FATF	Financial Action Task Force on Money Laundering	UNCTAD	United Nations Conference on Trade and Development
FDI	foreign direct investment	VaR	value at risk
Fed	Federal Reserve System (U.S.A.)	WBI	Wiener Börse Index (all-share index of the Vienna stock exchange)
FMA	Austrian Financial Market Authority	WEF	World Economic Forum
FOMC	Federal Open Market Committee (U.S.A.)	WIFO	Österreichisches Institut für Wirtschaftsforschung – Austrian Institute of Economic Research
FSAP	Financial Sector Assessment Program (IMF/World Bank)	wiiw	Wiener Institut für internationale Wirtschaftsvergleiche – The Vienna Institute for International Economic Studies
FWF	Fonds zur Förderung der wissenschaftlichen Forschung – Austrian Science Fund	WKÖ	Wirtschaftskammer Österreich – Austrian Federal Economic Chamber
GAB	General Arrangements to Borrow	WTO	World Trade Organization
GATS	General Agreement on Trade in Services		
GDP	gross domestic product		
GNP	gross national product		
GSA	GELDSERVICE AUSTRIA Logistik für Wertgestionierung und Transportkoordination GmbH (Austrian cash logistics company)		
HICP	Harmonised Index of Consumer Prices		
HIPC	Heavily Indebted Poor Countries		
HOAM.AT	Home Accounting Module Austria		
IBAN	International Bank Account Number		
IBRD	International Bank for Reconstruction and Development		
ICT	information and communication technology		
IDB	Inter-American Development Bank		
IFES	Institut für empirische Sozialforschung GesmbH – Institute for Empirical Social Research, Vienna		
Ifo	Ifo Institute for Economic Research, Munich		

Legend

- x = No data can be indicated for technical reasons
- .. = Data not available at the reporting date
- 0 = The numerical value is zero or smaller than half of the unit indicated

Discrepancies may arise from rounding.

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