Eesti Pank

Estonian
competitiveness
report

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The Estonian Competitiveness Report written by experts from Eesti Pank has changed a little in its structure, and this time covers international price competitiveness in terms of effective exchange rates, and competitiveness in a broader sense, which covers the global market share of Estonian exports and a disentanglement of price and non-price competitiveness. The third chapter looks at domestic competition, which is observed through an analysis of markups and the negotiating strength of workers.

The Estonian Competitiveness Report is published once a year.

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CONTENT

NON-TECHNICAL SUMMARY

The redesigned competitiveness report considers changes in Estonia's international price competitiveness and domestic competitiveness in 2014–2015. It also reviews changes in several indicators looking back over different periods to when Estonia joined the European Union or the euro area.

The previous format covered international price competitiveness using information from the European Central Bank, but the new analysis uses indicators from the European Central Bank, the BIS and Eesti Pank arrived at using different methodologies. As inflation has been very low in the euro area for the past two years or has moved into deflation, more attention has been paid to the movements against the euro of the currencies of trading partners with floating exchange rates, and less to changes in relative prices.

A wider selection of indicators gives a deeper picture of Estonia's external economic relations and allows for better assessment of the current situation. From indicators that describe the situation in Estonia more narrowly, it can be said that movements in Estonian nominal effective exchange rates do not always follow the trends of the euro area average. Over a shorter time period the indicators for Estonian nominal international price competitiveness can move asymmetrically against the euro area average, though they follow it in the longer view.

For relative prices, it depends where attention is being focused. In parallel with consumer prices becoming deflationary, faster wage growth than in trading partners has seen the unit labour cost-based real effective exchange rate climb back to its level of 2007–2008. Overall, the analysis of the changes in the effective exchange rates and relative prices suggests increased pressure on competitiveness in 2014–2015.

The previous treatment of international competitiveness in broader terms through the equilibrium real exchange rate has been replaced by a disentanglement of competitiveness into price and non-price competitiveness. Price and non-price competitiveness can be separated empirically using the methodology of the European Central Bank for dividing them into components of the foreign trade deficit or surplus. The outcomes from this methodology are qualitative, as they describe changes in price and non-price competition, but without any fundamental connections in the initial pilot project. Results so far show the structural trade deficit growing, indicating problems with non-price competitiveness in 2014. In the longer term no fundamental changes in competitiveness stand out in 2011–2014.

The treatment of domestic competitiveness draws on research into the level of competition in the goods and labour markets in Estonia in manufacturing and services, and looks at whether markups have changed since the global financial crisis. This is the first piece of research to analyse the markups of Estonian companies and how company profit is shared with employees. The methodology uses assumptions of both perfect and imperfect competition, as the perfect competition hypothesis is not often confirmed in the labour market. The findings indicate that competitiveness is better for manufacturing, which is more exposed to foreign trade, than for services. Competition has become tighter in several branches of manufacturing and services since the global crisis of 2009. If perfect competition is not assumed in the labour market, estimates of mark-ups increase, as employers in most sectors share quite a large part of their short-term profit with their employees.

The first part of this review covers international price competitiveness through effective exchange rates. The second part considers competitiveness in a broader sense, which covers the global market share of Estonian exports and a disentanglement of price and non-price competitiveness. The third chapter looks at domestic competition, which is observed through an analysis of markups and the negotiating strength of workers.
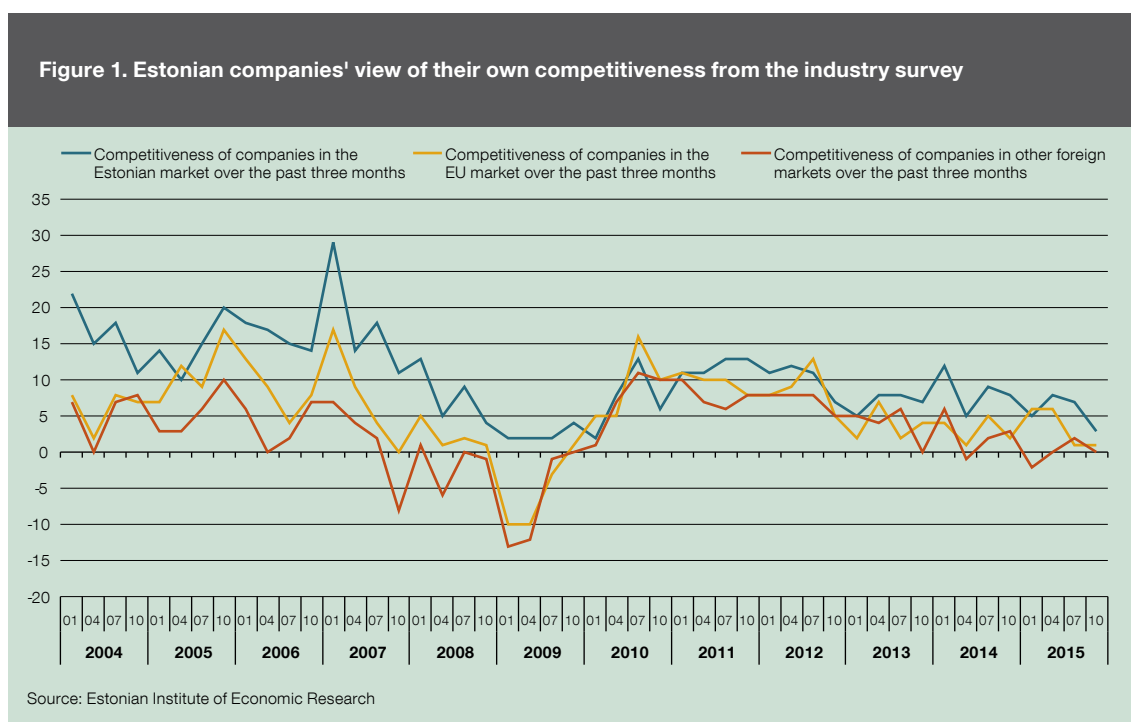
KEY POINTS

- The main trends of 2014 in international price competitiveness continued and deepened in 2015.

- In the past two years the currencies of Estonia's continental European trading partners that have floating exchange rates have weakened against the euro; this has compensated for a simultaneous rise against the euro in the US dollar and currencies following it.

- The depreciation of the euro against the dollar is generally supportive for competitiveness in the euro area, especially given the share of global trade that is in currencies linked to the dollar. The specific composition of the Estonian export markets means that the depreciation of the euro against the dollar has little impact here as the nominal effective exchange rates have strengthened over all foreign partners combined.

- The deflationary environment of the past two years has meant the change in the nominal effective exchange rate has had greater significance for the real effective exchange rate than the change in relative prices has, except in the case of the real exchange rate based on unit labour costs.

- Analysis of competitiveness at the micro data level and separate treatment of the price-based and non-price components indicate that there were no fundamental changes in competitiveness in 2011-2014; there are no comparative data for 2015 yet.

- The economy is becoming increasingly polarised in competitiveness terms as non-price competitiveness is improving for some groups of export goods while the structural trade deficit is growing for other groups of goods at the same time; in the past two years more groups of goods have moved into structural deficit than have moved out.

- The global market share of Estonian exports declined a little in 2013-2014. One reason for this is the fading of the CIS markets of Russia, Ukraine and Kazakhstan.

- The competitiveness of Estonian manufacturing and services is around the average for countries in Central and Eastern Europe.

- Competitiveness is better for manufacturing, which is more exposed to foreign trade, than for services.

- Competition has become tighter in several branches of manufacturing and services since the crisis of 2009.

- In the absence of perfect competition in the labour market, mark-ups are estimated to be higher, as employers in most sectors share a large part of their short-term profit with their employees. An average of 12-13% of short-term profit is shared with employees in Estonia, which shows that employees have a relatively good negotiating position in the Estonia labour market even given the minor role played by trades unions.

I. PRICE COMPETITIVENESS

International competitiveness cannot be measured directly and so it is hard to compare the competitiveness of different countries. Competitiveness is assessed using both direct and indirect methods, which are broadly divided between general assessments by international organisations like the World Economic Forum (WEF 2015) and estimates by the institutions within an individual country. These local estimates mainly show how competitiveness has changed within that country by comparison with the past.

Competitiveness can be divided into price competitiveness and non-price competitiveness, and the typical measures of price competitiveness are the dynamics of exchange rates and relative prices, which together are expressed in the effective exchange rates.

Starting from descriptive indicators, the first is the assessments that companies themselves make of their own competitiveness. Figure 1 illustrates how Estonian companies see their competitiveness has changed since accession to the European Union.

Figure 1. Estonian companies' view of their own competitiveness from the industry survey

Source: Estonian Institute of Economic Research

Their estimates of changes are close to the changes in the business cycle over the same period, reflecting the optimism at the time of accession, the economic boom of 2006–2007, the global financial crisis, and the subsequent recovery and the slow growth of recent years. The next figure shows the main currency exchange rates for the Estonian economy since entry to the euro area.

Floating exchange rates affect 41% of Estonia's foreign trade. Leaving aside the problems of the Russian rouble, there have been two main trends, with the US dollar, British pound and Chinese Yuan strengthening against the euro, and Central and Eastern European and Nordic currencies weakening against

Figure 2. Principal exchange rates against the euro

Source: Eesti Pank
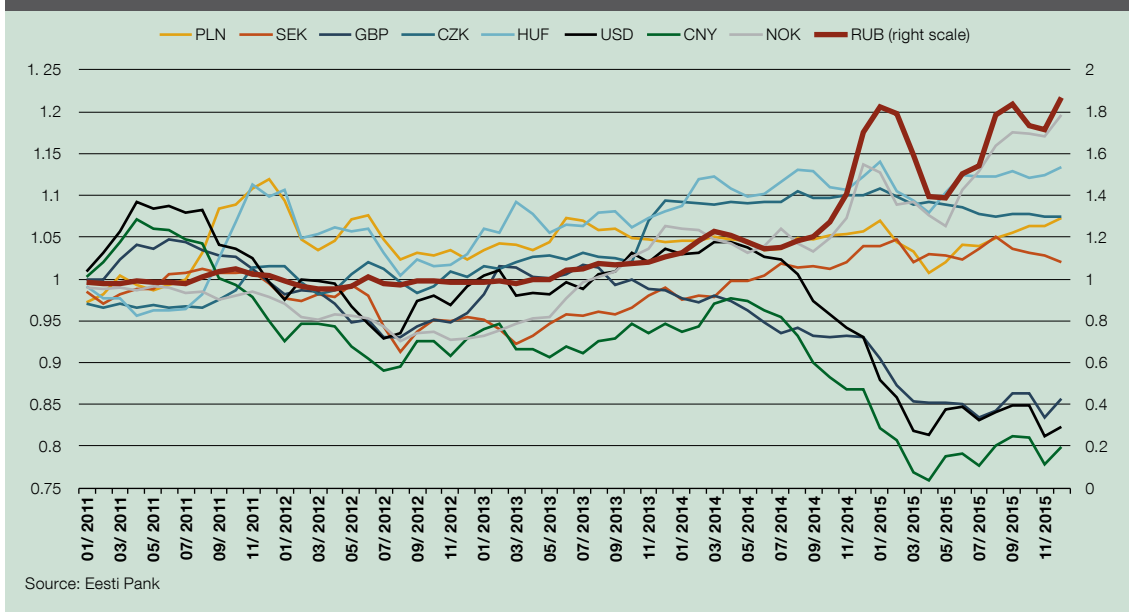
it. At first glance it appears that the strengthening and weakening of the currencies of Estonia's foreign partners with the rouble removed has been in relative equilibrium. If price competitiveness is to be considered through synthetic indicators, the next one to look at is the effective exchange rate.
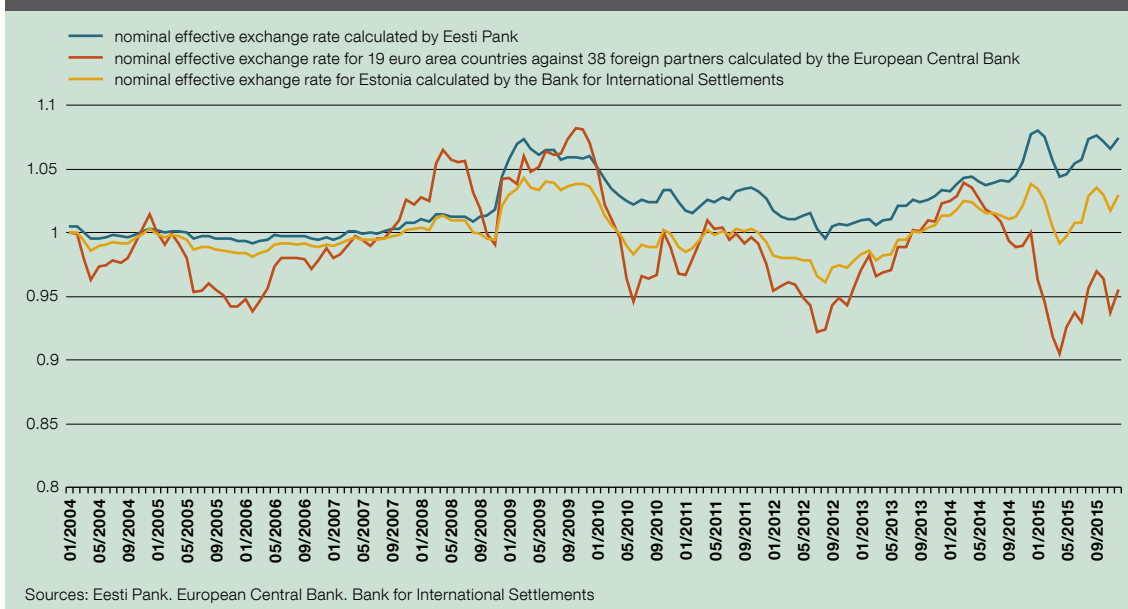
The nominal effective exchange rate

It should be noted first of all that there is no international agreement on a single method for calculating effective exchange rates. One more prominent method is the BIS method (BIS 2006), and the European Central Bank uses essentially the same method for the euro area, with some alterations and simplification (see ECB 2012a). Another interesting source is Ellis (Ellis 2001), which offers some further alternative algorithms for calculating effective exchange rates.

Eesti Pank also calculated nominal effective exchange rates until accession to the euro area, and the algorithm for this has now been updated and the resulting rate will again be published from the second half of 2016. This is needed for Estonia alone because the European Central Bank calculates the nominal effective exchange rate of the euro against various groups of foreign partners, but does not do so for each euro area member state individually.

The harmonised competitiveness indicators published by the ECB for euro area countries are by their nature real variables, as they are real effective exchange rates with relative prices included. This means that the nominal effective exchange rate for the euro and the harmonised competitiveness index are not directly comparable, since the nominal effective exchange rate for the euro is calculated only from extra-EU trade while the real effective exchange rate takes in both intra-EU and extra-EU trade. Figure 3 shows the nominal effective exchange rate for the euro calculated using three different methods.

Figure 3. Nominal effective exchange rates

nominal effective exchange rate calculated by Eesti Pank
nominal effective exchange rate for 19 euro area countries against 38 foreign partners calculated by the European Central Bank
nominal effective exhange rate for Estonia calculated by the Bank for International Settlements

Sources: Eesti Pank. European Central Bank. Bank for International Settlements

The methodological differences between the three ways of calculating lie in the way weights are assigned for countries and in the way internal and external euro area trade is treated. The BIS methodology takes the middle route as it essentially uses the same weights system as the European Central Bank but covers both internal euro area trade and external trade, while the ECB uses only external trade. It should be remembered that the ECB weighting system takes in only manufacturing exports and imports and export weights are counted twice[1] for estimating the competitiveness of the euro area in the markets of third countries. The Eesti Pank methodology uses the total turnover of foreign trade, not only industrial output, and both internal and external euro area trade.

Figure 3 shows the difference in the Eesti Pank and BIS effective exchange rates from the weighting system alone, but differences between the BIS and ECB exchange rates also come from the asymmetry in the relationship of the Estonian economy to the euro area as well as from the methodological differences, as the BIS figure uses both internal and external euro area trade and the ECB euro 19/38 calculation uses only foreign trade. Movements in the nominal effective exchange rate for Estonia differ from those for the average of the euro area because of Estonia's position as a small economy on the European Union's periphery.

To illustrate this, the appreciation in the Estonian nominal effective exchange rate in 2015 came primarily from Russia, which has a market share of 7.7%, and to a lesser extent from Central and Eastern Europe and the Nordic currencies, which together have market share of 25%. This was partly offset by the appreciation against the euro of the US dollar, the British pound and the Chinese yuan, which have combined market share of 8.4%.

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1 It does not automatically follow from the BIS methodology that the export weights are doubled in the calculation of effective exchange rates. This permits the simplifying assumption that countries in the euro area compete among themselves in domestic markets and then in a second round in external markets. This assumes that no third countries export or produce industrial products and that all the supply of industrial products comes only from the euro area and countries where the euro area is competing.
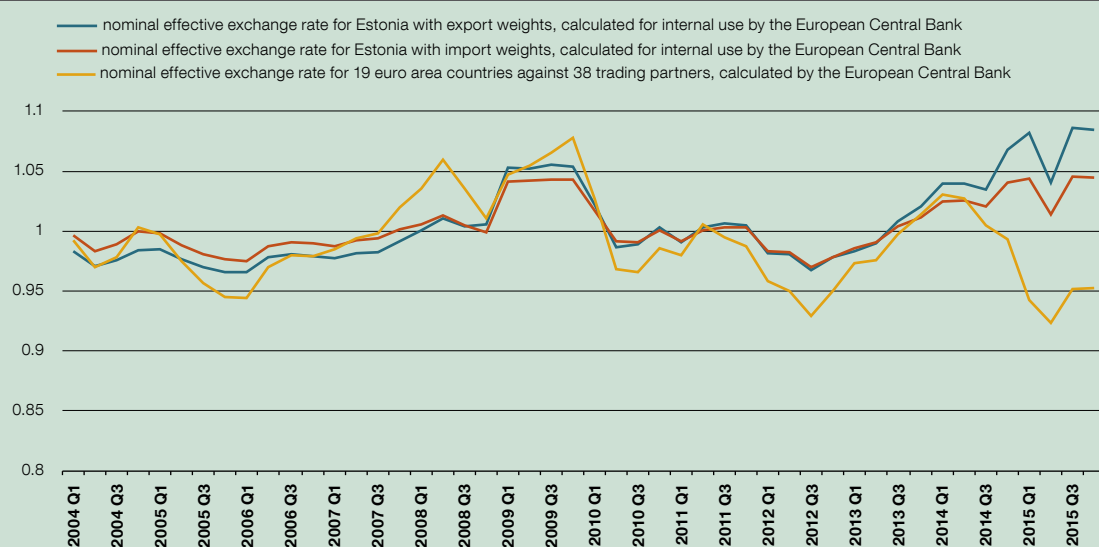
To eliminate these methodological differences entirely, it is necessary to use a single methodology, and the only reasonable choice for this is the ECB method, which also calculates nominal effective exchange rates for individual euro area member states for internal use, though it does so with separate weights for exports and imports (see ECB 2010), so this case is not quite a unified methodology either. This means that the asymmetry of the expressions of the Estonian and euro area averages in their effective exchange rates remains an issue.

Comparing Figures 3 and 4 reveals that particular nominal effective exchange rates can have quite different dynamics. Figure 4 further shows that the nominal effective exchange rate calculated for the 19 euro area countries with respect to 38 trading partners has the same dynamics as the Estonian rate over the long term, but does not necessarily match the changes in a small and open economy at the edge of the euro area at every given moment in time.

An economic policy conclusion from this is that the results for the past two years are different depending on the indicator used, as the euro 19/38 nominal effective exchange rate has weakened for the euro area as a whole, while that for Estonia has strengthened. That strengthening occurred mainly, though not exclusively, because of the depreciation of the Russian rouble, which has in turn been partly offset by the depreciation of the euro against the dollar and currencies linked to it. Overall this indicates a tense competitive position, similar to that of 2014.

It may be noted in conclusion to this section that the restarted Eesti Pank calculations of effective exchange rates offer something more than those discussed here, as the nominal rate is calculated with separate weights for exports and imports and separately for euro and non-euro (and not non-EU) trading partners (see Figures 14 and 15 in Appendix 1).

Figure 4. Nominal effectvie exchange rates calculated by the European Central Bank for the euro area and for Estonian exports and imports

— nominal effective exchange rate for Estonia with export weights, calculated for internal use by the European Central Bank
— nominal effective exchange rate for Estonia with import weights, calculated for internal use by the European Central Bank
— nominal effective exchange rate for 19 euro area countries against 38 trading partners, calculated by the European Central Bank

Source: European Central Bank
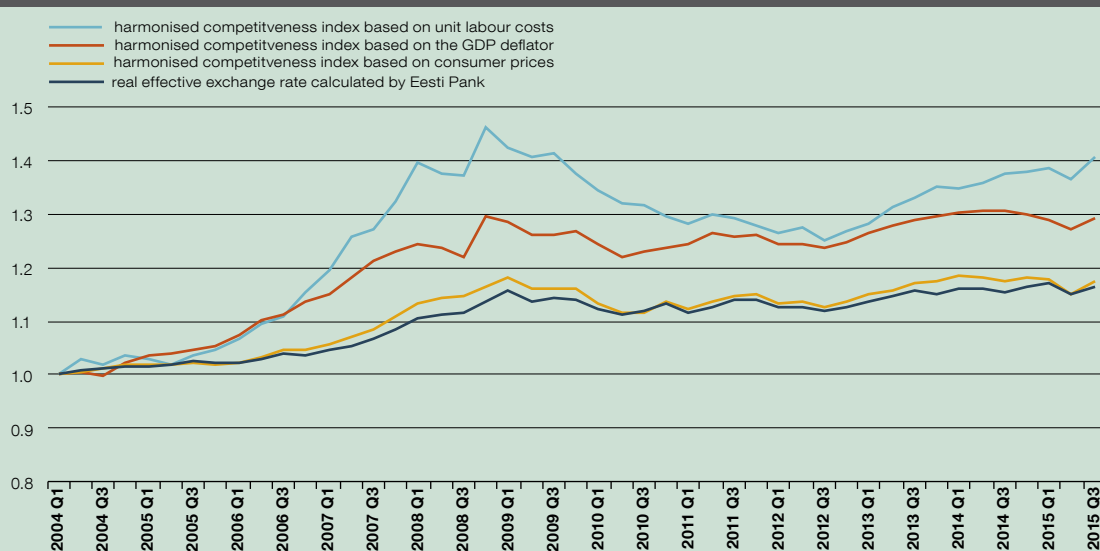
The real exchange rate and relative prices

The real effective exchange rate can be found using the European Central Bank's harmonised competitiveness indicator (HCI). This is calculated using both euro area internal trade and external trade, and the results are comparable with the real exchange rate found by Eesti Pank.

In contrast to the nominal effective exchange rate, the ECB calculates this indicator for each euro area member state individually on the grounds that the real effective exchange rate is a more informative indicator of competitiveness than the nominal rate, primarily because the real rate also considers relative prices. Real effective exchange rates are mainly based on consumer prices, as these provide information faster, on a monthly basis, and because there are limitations to using the GDP deflator or unit labour costs, which are the other common indicators for relative prices[2].

The real effective exchange rate calculated by Eesti Pank from the starting base of consumer prices and shown in Figures 5 and 6 is in practice very close to the European Central Bank's harmonised competitiveness indicator based on consumer prices. The real effective exchange rate calculated from a starting base of unit labour costs also takes in the trend of the past few years of rapidly rising wages in Estonia, which has led the ULC-based real effective exchange rate to appreciate faster than other indicators.

The current level of the real effective exchange rate is comparable to that of 2008. In 2008 nominal factors had a smaller role than domestic inflation in the rise in the real exchange rate, although during the global crisis many currencies depreciated for a short time against the euro, and so against the Estonian kroon that was pegged to it. In the past two years the movements in relative prices have had little impact

Figure 5. Harmonised competitiveness index of the European Central Bank and the real effective exchange rate from Eesti Pank (quarterly data)

- harmonised competitveness index based on unit labour costs
- harmonised competitveness index based on the GDP deflator
- harmonised competitveness index based on consumer prices
- real effective exchange rate calculated by Eesti Pank

Sources: European Central Bank, Eesti Pank

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2 The GDP deflator is too broad-based an indicator for this as it also covers services, imports and more, while unit labour costs reflect only production costs and are generally available only for advanced countries. In any case, both are usually calculated only quarterly.
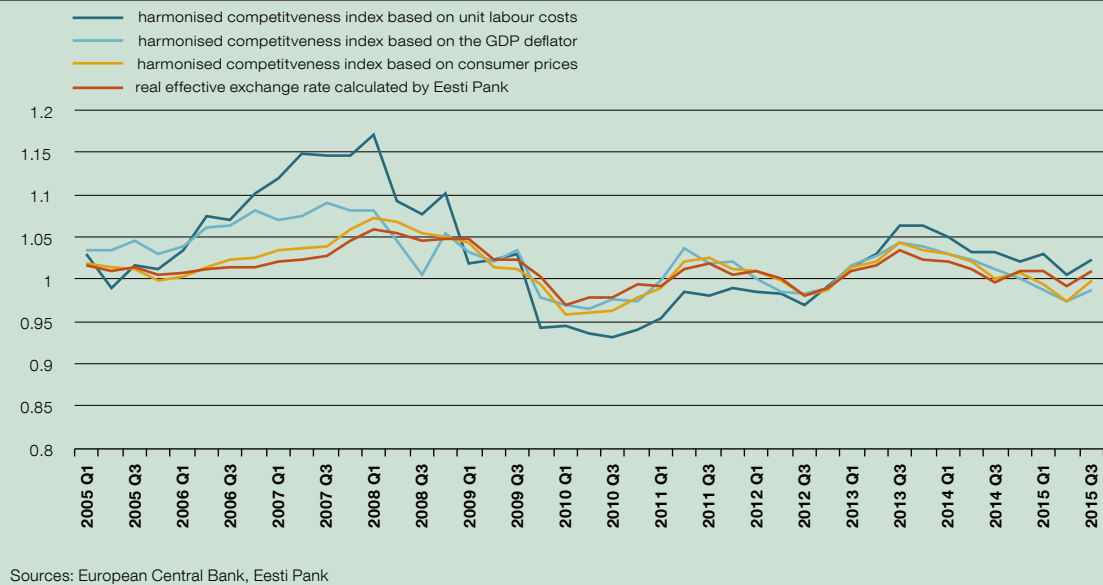
Figure 6. Harmonised competitiveness index of the European Central Bank and the real effective exchange rate from Eesti Pank (year-on-year change)

- harmonised competitveness index based on unit labour costs
- harmonised competitveness index based on the GDP deflator
- harmonised competitveness index based on consumer prices
- real effective exchange rate calculated by Eesti Pank

Sources: European Central Bank, Eesti Pank

because of the long period of very low inflation or deflation, though unit labour costs have risen rapidly. The consumer index was negative for the year as a whole in both 2014 and 2015 according to data from Statistics Estonia. This equally explains why more attention is paid to nominal effective exchange rates in this report than to real rates.

Figure 7. Terms of trade

- export price index (left scale)
- import price index (left scale)
- terms of trade (right scale)

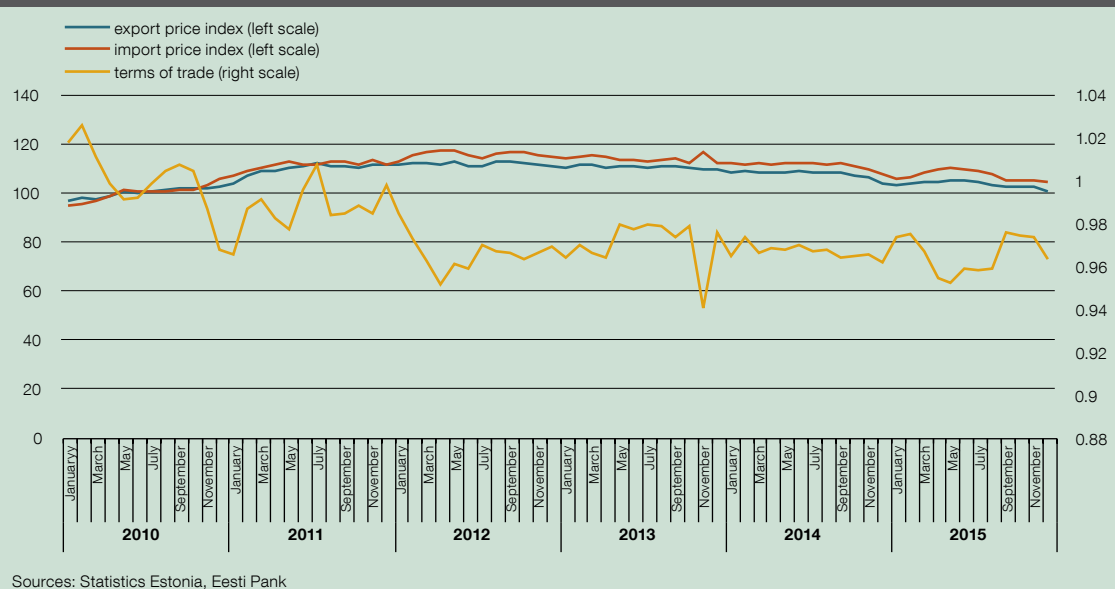Sources: Statistics Estonia, Eesti Pank

Figure 7, the last in this section, shows terms of trade, or the changes in the prices of exports and imports. It covers a shorter time period and shows the time when Estonia has been a member of the euro area. Terms of trade have tightened, shown when the index is below 1, at the same time that the nominal effective exchange rate has strengthened, from the second half of 2012.

Summary of price-based competitiveness

- *In 2014–2015 the exchange rates of Central and Eastern European and Nordic countries with floating rates depreciated against the euro, but this was offset by an appreciation against the euro of the US dollar and currencies linked to it. Leaving Russia aside, the Estonian nominal effective real rate was stable in 2015, but still moved asymmetrically against the weakened Euro 19/38 nominal effective exchange rate for the euro area average.*

- *The depreciation of the euro against the dollar is generally supportive for competitiveness in the euro area, given the share of global trade that is in currencies linked to the dollar; the specific composition of the Estonian export markets means that the depreciation of the euro against the dollar has less impact here, and the Estonian competitive position has come under pressure with respect to all groups of foreign partners combined.*

- *The deflationary environment of the past two years has meant the change in the nominal effective exchange rate has had greater significance for the real effective exchange rate than the change in relative prices has, except in the case of the real exchange rate based on unit labour costs.*

II. COMPETITIVENESS IN THE BROADER SENSE

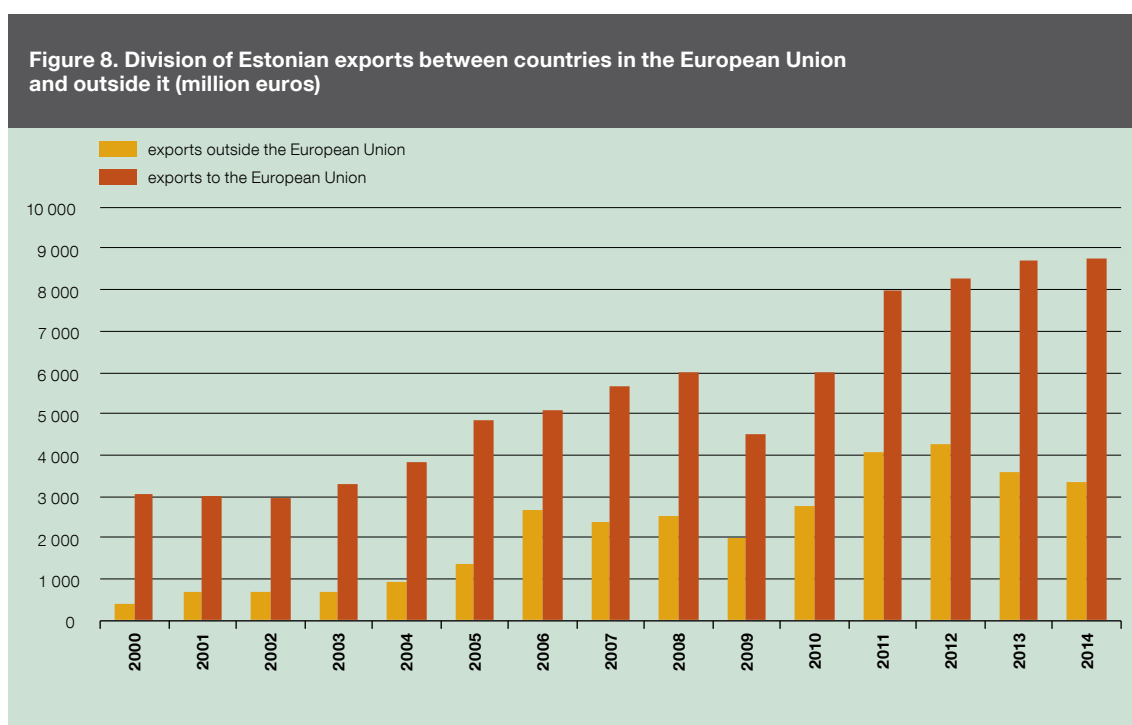### Global market share of Estonian exports

One measure of competitiveness is the global market share of a country's exports. As the market share of exports is determined by a wider set of factors than is used for price competitiveness, it is a good starting point for looking at competitiveness in the broader sense.

A thorough consideration of the competitiveness of Estonian exports is a subject in itself and is beyond the scope of this report. The market share of exports is taken here as one indicator of competitiveness, and this review will limit itself to an assessment of Estonia's market share in the exports of the European Union, which can be extrapolated to cover the whole world.

The figures for the European Union from the OECD International Trade MEI (Main Economic Indicators) database are used here. This database can be used to find a European Union member state's share of the internal exports in the EU by volume or proportionally, or the same shares of exports beyond the EU using the SITC06 classification at fob (free on board) prices. The results are shown in Figures 8 and 9.

Figure 8 shows the situation in 2014 for Estonia's internal exports within the European Union to have been unchanged. The distribution of exports between the euro area and the rest of the European Union reveals a slight fall in exports heading to the euro area, but this is offset by growth in those to EU countries that are not in the euro area.

Scaling this up to the global level, it should be remembered that the European Union has a share of approximately 32.7% of total global exports, or about one third. Data from 2013 are used for the broader

Figure 8. Division of Estonian exports between countries in the European Union and outside it (million euros)

Figure 9. Market share of Estonian exports in the domestic and external trade of the European Union (percentage point)

- non-European Union market share
- European Union market share
- average market share

Source: OECD MEI (Main Economic Indicators)
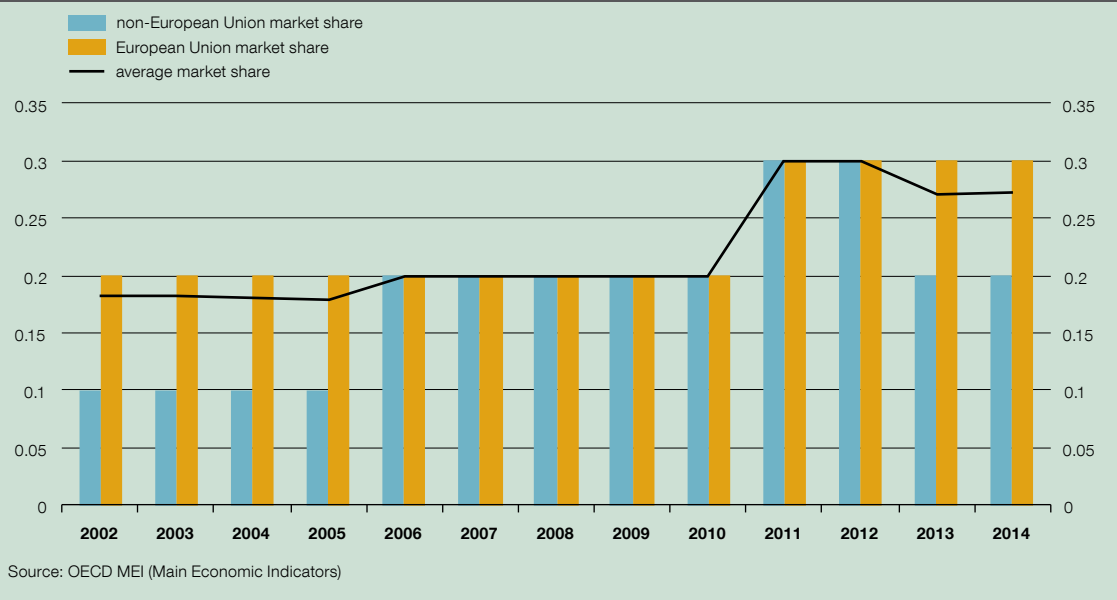
calculation, as there were no newer data in the MEI database, and these show Estonia's share of the global market to have been 0.087%. Assuming that EU exports maintained their global market share in 2014, Estonia's market share will have remained the same.

Figure 10 Estonian exports 2013-2015 (million euros)

- total without EU-28 (left scale)
- total without EU-28 and CIS (left scale)
- total (right scale)

Source: Eesti Pank
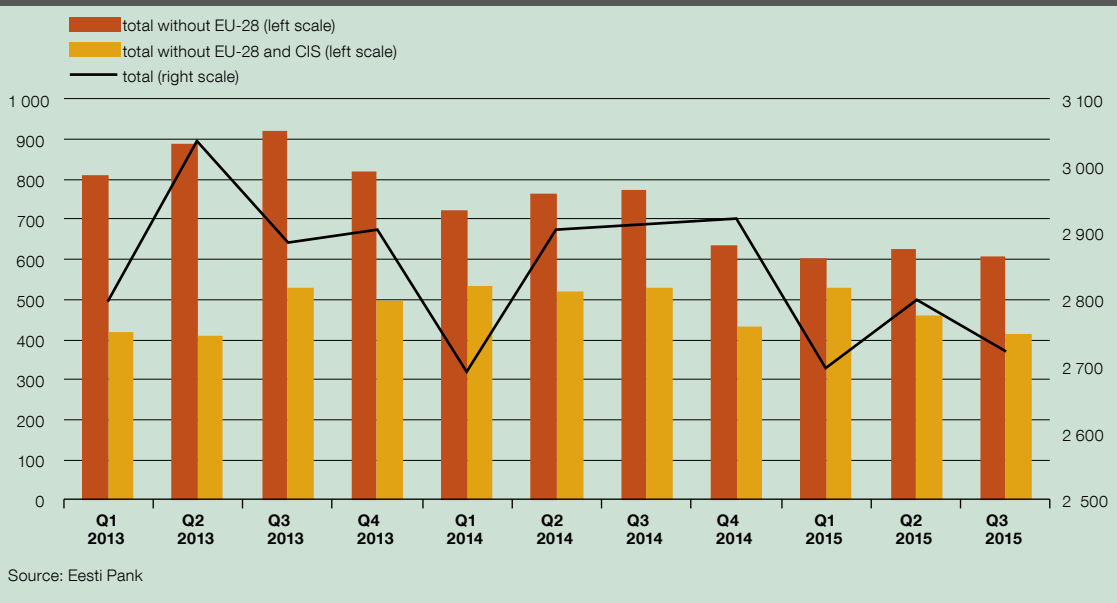
Narrowing the focus to the past couple of years to analyse the source of the small fall in market share, it becomes clear that one cause of the fall was the markets of the CIS, as can be seen by comparing Figures 8 and 10.

The medium-term reduction in the market share of Estonian exports due to the markets of the CIS is shown by quarterly balance of payments data for 2013–2015, without temporary and one-off factors. The reduction is broad-based across the larger countries of the CIS and is apparent in Ukraine and Kazakhstan as well as Russia.

Well-known international comparisons of Estonia's competitiveness position and the vulnerability of the economy can be used to provide the context for the position of the market share of Estonian exports. International assessments of the competitiveness of the Estonian economy are intriguingly high even though growth in exports and market share has stagnated in recent years.

The World Economic Forum puts Estonia in 29th place in the world for competitiveness, behind China and ahead of Iceland, which is the best result of any country in Central and Eastern Europe. The next country from that region is the Czech Republic in 37th place, while the other Baltic states are in 41st and 42nd, with Lithuania ahead of Latvia. The WEF competitiveness index is based on three subindexes: the basic requirements subindex, the efficiency subindex, and the innovation and sophistication factors subindex (see Appendix 2). For more on Estonia see pages 176-177 of the report (WEF 2015).

The ECB Surveillance Report of 2015 put the vulnerability index for Estonia low compared to the OECD average. This index contains two types of indicator. One type is stock indicators that show private, public and external debt; employment; unemployment; the share of long-term unemployment; overdue loans; potential growth; and investment as a share of GDP. The other type is flow indicators for the current account deficit, the primary budget balance of the state, and unit labour costs.

The treatment of competitiveness can also be broadened to non-price factors to explain how far the trends that appear there support the evidence found so far or do not support it.

Non-price competitiveness

In the past couple of decades the subject of non-price competitiveness has gained ever more prominence alongside price competitiveness. It has been argued that price competitiveness has not been able to explain the movements of trade flows or foreign deficits and surpluses in the member states of the European Union since the middle of the 1990s (European Commission 2010). Non-price competitiveness covers many factors, including product quality, specialisation, sales efficiency, the business environment, after-sales service and the characteristics of exporting companies (ECB 2012).

For small countries this list can also include niche markets, because small countries are not represented by all products in all markets to the same extent as large countries are. Success in niche markets can depend a great deal on non-price factors.

Non-price competitiveness in this definition is more of a generalisation based on the principle of exclusion that takes in the factors that are not reflected in price-based competition. The list of such factors is not limited, and ten examples are given here, most of which are also listed by the ECB (ECB 2006):

i. specific features of markets for exports of goods and services;
ii. research and development activity, also as a percentage of GDP;
iii. number of patents;
iv. foreign direct investment, both incoming and outgoing;
v. technological progress in the services sector;
vi. education, both higher and vocational secondary education;
vii. effectiveness of the legal environment for contracts in terms of time and costs;
viii. employment protection[3];
ix. regulation of goods markets;
x. specific features of tax policy.

The individual indicators in this list can be measured but the combined effect is quite hard to compare across countries. Furthermore, the list is not exhaustive, and it is also possible that different factors can amplify or negate each other.

This is the issue of the general economic policy mix. In this sense non-price competitiveness is closely linked with the past and present of overall economic policy and is essentially the product of that.

Non-price competitiveness depends not only on the state of the economy and foreign demand, but also on the legal environment, education reforms and other national policies. For this reason inter-national organisations have considered similar topics in their periodical reports analysing the Estonian economic environment (see OECD 2014 for example). The topics highlighted in the OECD report on Estonia focused on innovation, including public-private partnerships, regula-tion of product markets, the efficiency of the bankruptcy process, and the funding of small and medium-sized enterprises.

This report considers non-price competitiveness using a quantitatively measurable basis as far as it is currently possible. Despite some progress in measuring non-price competitiveness factors however, the information used is still qualitative and should best be seen as having signal value. So although a quan-titative approach has been taken, the results should be interpreted mainly as trends and tendencies, not as absolute values.

Methodology for the empirical form of non-price competitiveness

The algorithm used for this comes from the European Central Bank (ECB 2012b). The focus of the approach used here is slightly different from that in the ECB article, as it only partly uses the algorithm described in the article because the aims are not the same. The ECB article is looking to decompose the external deficits of the countries in the euro area, but here the aim is to separate price and non-price competitiveness empirically. Both approaches use micro data.

The initial data come from the UN database of foreign trade, Comtrade. This is a large and compre-hensive database that allows for an overview of the foreign trade transactions of the countries being observed, using micro data at the chosen level of detail. A key point is that the Comtrade database contains information on both prices and volumes. This makes it possible to analyse the exports of a country not only by their value, but also by quantities of goods, and indirectly to estimate the parameters that depend on quality and through that the non-price competitiveness factors (a typical example is the success of Mercedes-Benz cars in the Chinese market).

3 Employment protection is the OECD indicator that shows the efficiency of the hiring and firing processes and the related costs. The ECB Surveillance Report 2015 put Estonia in first place in the EU for this with best practices.

To maintain comparability with the Statistics Estonia database on foreign trade, the HS06 classification is used here, as this is equivalent to the four-digit combined nomenclature code used by Statistics Estonia in their foreign trade statistics. The HS06, or the six-digit harmonised system, gives results for over 5000 groups of goods in each section, so as the number of views, or cuts, rises, the number of observations considered increases with great speed and can make the information technology side of the project difficult to manage.

The steps in the algorithm used here are:

i.   Groups of goods are only used when there are both imports and exports for the reporting country, and identifying these groups is the first filter. Net fuel is also excluded as this would give some countries a natural competitive advantage. Exports and imports of services are not observed because of the difficulty in estimating them in step (ii).

ii. The unit values UVX and UVM are found for exports and imports by dividing the value of the exports or imports by the volume in kilograms, litres or whatever is appropriate for each group of goods.

iii. The relative export value is found as log(UVX/UVM), and this gives the sign for the relative export value; whether it is positive or negative will depend on whether UVX is larger or smaller than UVM.

iv. Next, all groups of goods are divided into four categories depending on which is larger of UVX and UVM, and whether the foreign trade balance, TB, of the group is above or below zero.

v.   The net exports to be considered, which is the share of exports for which there is a match in the imports of the same groups of goods, are divided into four groups using the following logic:

	Higher relative export value (UVX>UVM)	Lower relative export value (UVX<UVM)
TB>0	Strong non-price competitiveness Non-price+	Strong price competitiveness Price+
TB<0	Deficit of price competitiveness Price-	Structural deficit Non-price-

vi. Then the net export volumes are totalled for each quadrant. This gives the net export volumes for each type of competitiveness: price+, price-, non-price+, and non-price-. This shows how much each category of net exports contributes to the foreign trade balance.

So far the algorithm is exactly the same as in the ECB article, but now the aims diverge, and so it is possible to leave out the final point of the ECB algorithm.

vii. The net sums for the price-based categories (quadrants II and III) and non-price categories (quadrants I and IV) are found, as are those for the categories of 'net fuels' and 'other' as a ratio of GDP. 'Other' is the part of exports for which there was no match in imports and imports for which there is no match in exports. The final result is the trade balance as a ratio to GDP divided into four parts: price, non-price, other, and net fuels. Net services can be added to that and the total of those five categories equals the balance of trade for goods and services as a ratio to GDP. As competitiveness changes relatively slowly, the recent indicators using the ECB methodology have been found as the average over longer periods[4].

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4 Periods covered are 1999–2007 and 2008–2010. This method has been used for Estonia, and the result was that 1999–2007 had positive non-price competitiveness for Estonia and 2008–2010 had negative non-price competitiveness. However it should be noted that in 1999–2007 the largest contribution for Estonia came in the category 'other', which means the answer is inconclusive because there was little diversity in trade as there were a relatively large number of groups of goods for which there were no exports or imports. The positive balance for services is quoted for all small countries, including Malta, Cyprus and Luxembourg, as offsetting the trade deficit.

The aim here is to divide net exports by separating out price and non-price competitiveness, so only the four divisions found earlier are important for the analysis of competitiveness.

The next move depends on the aims, because the database is so large that it is not realistic to follow multiple aims at once in the current pilot project. So the initial task is designed with Estonia as the reporting country and the rest of the world as the partner, and a time horizon of Estonia's membership of the euro area in 2011–2014[5]. The final goal is to analyse the changes in both price and non-price competitiveness that have occurred while Estonia has been using the euro.

The interpretation of the outcomes depends to a large extent on which data are used and why. The first requirement was to separate out the groups of goods that were exposed to price or non-price competition, and the changes in them in 2011–2014. For this reason, bilateral relationships such as Estonia-Latvia, Estonia-Lithuania, Estonia-Finland and Estonia-Russia were not observed. To get the best comparability, a competitor like Finland can be chosen as the reporting country, on the grounds that Finland is Estonia's most important trading partner. The time horizon can also be extended back-wards so that past trends in competitiveness can be analysed, though this does not necessarily give very good results (see footnote 4).

A couple of final remarks can be made on the methodology. Firstly, using micro data solves the issue of subcontracting by including intermediate consumption, which would have remained present if macro data had been used. Secondly, the results should be interpreted with care. The algorithm described here appears to be quantitative, but it would be more accurate to say it is essentially a qualitative estimate in quantitative form.

Non-price competitiveness: results

The limits of the time horizon must be considered as the Comtrade database has only yearly frequency and new data arrive with a lag. The first filter for the simultaneous presence of exports and imports gave an average result of 92-94% of the value of exports and imports, and the figure was even higher with other criteria such as volumes.

The intermediate technical steps are not important here, but the first view sought is the division of net turnover of the groups of goods in foreign trade into four parts: price+, price-, non-price+, and non-price-, together with their changes for 2011–2014. The consolidated results from micro data are shown in Figure 11.

The columns on the figure show the contribution to the balance of trade in millions of euros. As the data are essentially the yearly balances for the groups of goods, it is not possible to process them much further. The 'price' and 'non-price' categories can also be added together to get a net result. The net sums for the groups of goods for non-price competition are slightly negative for 2011–2012, and this is in line with the findings of the ECB for 2008–2012 (ECB 2012), which overlaps this by two years.

The general finding is that no fundamental changes in the competitiveness of the Estonian economy were found with this method for the years 2011–2014. Both of the plus categories indicate that the economy has no serious competitiveness problems and the consolidated picture suggests the

5 The original programme called for 2010 to be covered as well, so that the whole five-year period 2010–2014 would be consi-dered, but the data for 2010 were not available.

Figure 11. Balances for groups of products divided into four competitiveness categories, total exports (million euros)

Legend:
- 2011
- 2012
- 2103
- 2014

Categories: non-price-, non-price+, price+, price-

Source: Eesti Pank

probability of the economy being polarised in its non-price competitiveness, with both the plus and minus sides increasing over time.

The minus categories are the most revealing. A reduction in the contribution of price- is evident, which is probably an indicator of the efforts made by exporting companies to maintain or improve their competitiveness on price, which happened in 2013–2014 when price competition was tight, as discussed earlier. The problematic category is non-price-, which the methodology describes as a structural deficit. This is the groups of goods where the quality of exports is worse and the size of the negative contribution from the trade deficit is increasing over time.

The same data can be observed in aggregated form. Another view is given by the net contributions to the foreign trade balance by the main groups in the Harmonised System[6], which give the totals of the price and non-price subdivisions for groups of goods. Figure 12 shows examples from those groups where non-price competitiveness has moved from minus to plus for one group, and from plus to minus for four groups. The figure does not show the group of animals and animal products. It should again be remembered that these are indicative values that only illustrate the change in non-price competitiveness for the groups of goods in 2011–2014. Alongside the non-price factors, the figure also shows the changes in the price-based part for the same groups of goods.

A third view of the period 2011–2014 is given by Figure 13, which shows the average effect of groups of goods contributing to the foreign trade balance in 2011–2014 on non-price competitiveness only. This is then the net result of the non-price+ and non-price- categories for all the main groups.

6   Using the HS06 code there are 16 aggregated levels of groups of goods. Goods are divided into 15 main groups, but the subgroup for fuels in the mineral products main group is left out; the specific features of the methodology mean that exports of electricity are also excluded, as electricity is in the subgroup of fuels. The last group, the 16th, is for services, which are not covered by the algorithm.

Figure 12. Product groups that have seen the biggest changes in non-price competitiveness (million euros)

Legend: 2011 | 2103 | 2012 | 2014

Textiles

Footwear/headgear

Raw hides, skin, leather & fur

Vegetable products

Source: Eesti Pank
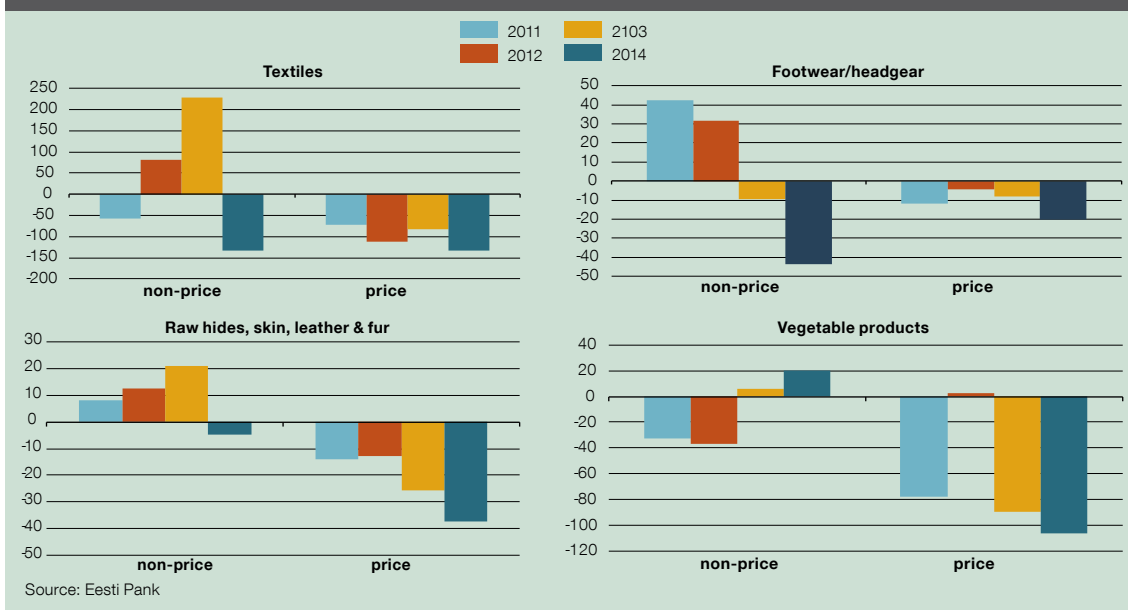
Figure 13 illustrates the least and most successful groups of goods in terms of non-price competitiveness. Thorough analysis is required of the developments in the economic sectors behind these groups of goods.

Figure 13. Net effect of groups of goods on the foreign trade balance, ranked by non-price competitiveness factors (2011-2014, million euros)

- wood & wood products
- miscellaneous
- stone/glass
- metals
- textiles
- raw hides, skin, leather & fur
- footwear/headgear
- vegetable products
- animals & animal products
- plastics/rubbers
- foodstuffs
- machinery/electrical
- transportation
- chemicals & allied industries

- 400   - 300   - 200   - 100   0   100   200   300   400

Source: Eesti Pank
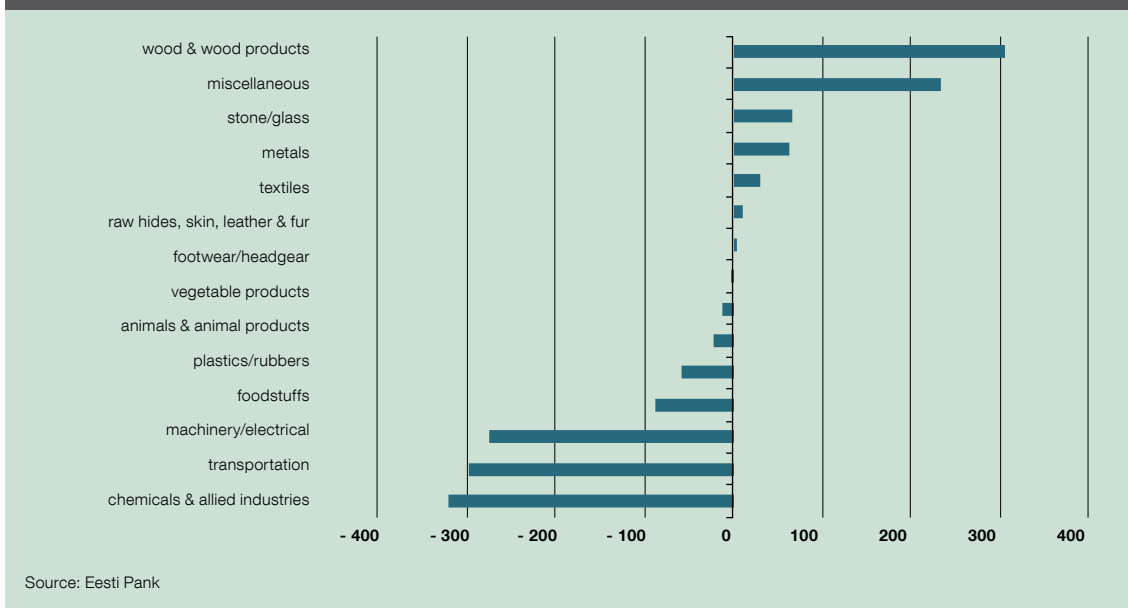
This means that another topic that is related to competitiveness is the structure of the economy. A deeper interpretation of Figure 13 would require the different types of competitiveness to be linked to the structure of the economy, preferably in international comparison.

Finally, the opinion of the IMF can be noted here (IMF 2015), that the best companies in Estonia are almost at the Scandinavian level as a proportion of the economy and in their innovation, but there are fewer mid-high-tech manufacturing companies by employment, or knowledge-intensive market services companies by value added. Estonia is known for its software development, with Skype, Kazaa and GrabCad, and for its innovative oil shale sector. Despite this, traditional sectors dominate in the Estonian economy. Agriculture, industry and construction provide about one third of the value added in Estonia, but only one quarter on average in the European Union. Wood processing, furniture and textiles provide around 40% of employment and 27% of value added within the manufacturing sector, but in the European Union they provide an average of 17% of employment and 10% of value added. Exports reveal basically the same picture.

Conclusions on competitiveness in the broad sense

- Analysis of competitiveness at the micro data level and the division into price and non-price components indicate that there were no fundamental changes in competitiveness in 2011–2014; there are no comparative data for 2015 yet.

- The economy is becoming increasingly polarised in non-price competitiveness terms as competitiveness is improving for some groups of export goods while the structural deficit is growing for other groups of goods at the same time; in the past two years more groups of goods have moved into structural deficit than have moved out. The rapid growth in the structural deficit in 2014 is worth particular note.

- Estonian exports lost market share globally in 2013–2014, partly because of the decline in market share in the CIS nations of Russia, Ukraine and Kazakhstan.

Appendix 1. Nominal effective exchange rates[7]

Figure 14. Nominal effective exchange rates*

Legend:
- nominal effective exchange rate calculated by Eesti Pank
- against the euro area
- against non-euro area

*Nominal effective exchange rate calculations made by Eesti Pank
Source: Eesti Pank
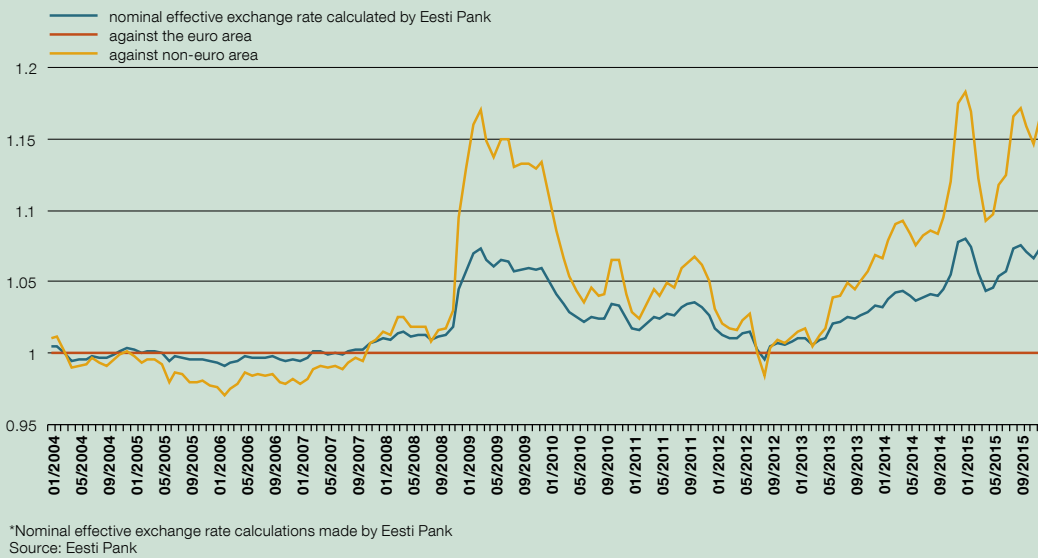
Figure 15. Nominal effective exchange rate index with export and import weights

Legend:
- nominal effective exchange rate with export weights
- nominal effective exchange rate with import weights
- nominal effective exchange rate

Source: Eesti Pank
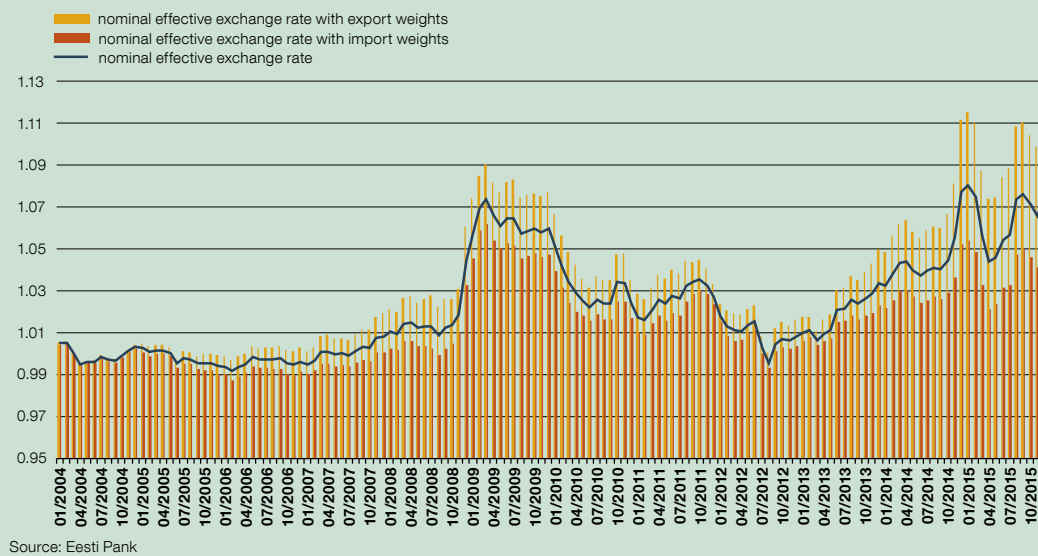
7 Nominal effective exchange rates are calculated by Eesti Pank using data from the European Central Bank and the BIS.

Appendix 2. World Economic Forum global competitiveness index methodology

Üleilmse konkurentsivõime indeksi raamistik

GLOBAL COMPETITIVENESS INDEX

Basic requirements subindex	Efficiency enhancers subindex	Innovation and sophistication factors subindex
Pillar 1. Institutions **Pillar 2.** Infrastructure **Pillar 3.** Macroeconomic environment **Pillar 4.** Health and primary education	**Pillar 5.** Higher education and training **Pillar 6.** Goods market efficiency **Pillar 7.** Labour market efficiency **Pillar 8.** Financial market development **Pillar 9.** Technological readiness **Pillar 10.** Market size	**Pillar 11.** Business sophistication **Pillar 12.** Innovation
Key for factor-driven economies	**Key for efficiency-driven economies**	**Key for innovation-driven economies**

III. ESTONIAN FIRMS' MARKUP AND THE BARGAINING POWER OF WORKERS

Motivation

Markups show the level of competition in a market. High competition ensures effective resource allocation within and between markets. However, there is plenty of evidence that the hypothesis of perfect competition is often rejected empirically, that firms can have substantial market power, and that labour markets are imperfect, so that part of the profits gets shared by workers (e.g. Dobbelaere (2004), Crépon et al. (2005), Amador and Soares (2014) and Soares (2016)).

This section studies the level of competition in product and labour markets across manufacturing and services industries in Estonia and studies whether the markups have changed after the Global Financial Crisis. It is the first study to analyse firms' markups and rent sharing with workers in Estonia. There is a comparable study by Marinov (2010) that estimates markups in Central and Eastern Europe, but he studies only the manufacturing sector and does not take into account the imperfect competition in the labour market. He finds Estonian markups to be at the average for Central and Eastern European countries and estimates that trade and competition policies have a minor effect on the competitive environment in Estonia. There are also annual reports by the Estonian Competition Authority, but their focus is on sectors with a natural monopoly and on mergers and acquisitions rather than on describing the level of competition in the whole of the private sector.

Methodology

The most common approach in deriving markups is based on the assumption of perfect competition in factor markets, e.g. the seminal papers by Hall (1988) and Roeger (1995). More recent literature following Crépon et al. (2005) has taken account of imperfect competition in the labour market. Their approach provides estimates of markups that are more consistent with reality and they also estimate average rent sharing between firms and workers. It has been shown that ignoring imperfect competition in the labour market can lead to substantial underestimation of markups (Crépon et al. (2005), Dobbelaere (2004), Amador and Soares (2014), and Soares (2016)).

There are two common approaches to calculating markups, one inspired by Hall (1988) and the other by Roeger (1995). The approach by Hall (1988) is based on the Solow residual and has the advantage of estimating the returns to scale parameter, as it takes the increasing or decreasing returns to scale into account. However, this approach is prone to endogeneity and measurement error problems because the error term also contains unobserved productivity shocks, and the deflation of firm-level variables with industry-level prices leads to measurement errors. Roeger's (1995) approach makes it possible to avoid these problems by use of the primal and dual optimisation problem of the firm, and derives a specification that makes it possible to cancel out the technical change term and estimate at nominal terms. In this section we use Roeger's (1995) approach, which is described in more detail by Soares (2016) and is based on the common database created by the European Central Bank Competitiveness Research network (see Lopez-Carcia et al. (2014), Amador et al. (2016), and Soares (2016)).

The detailed methodology can be found in Roeger (1995), Crepon et al. (2005) and Soares (2016), and this section presents only the empirical specification following this methodology. Imperfect competition

in the output markets would mean that marginal revenues no longer equal marginal costs, attributing the differences between marginal revenues and marginal costs to the markup. Output elasticities would become:

$$\varepsilon_{it}^{j} = \mu_{it} s_{it}^{j} \tag{1}$$

where μ_{it} denotes firm markup as the ratio of output price to marginal revenue or marginal cost and s_{it}^{j} denotes input shares in revenue. If price exceeds marginal cost, the input share underestimates the output elasticity ε_{it}^{j}.

Combining the Solow residuals from profit maximisation and the dual problem of cost-minimisation allows the technological progress term to be cancelled out and the following equation to be estimated where the dependent variable is the difference between the Solow residuals from the primal and the dual problems:

$$SR_{it} - SR_{it}^{d} = (\Delta p_{it} + \Delta q_{it}) - s_{it}^{L}(\Delta w_{it} + \Delta l_{it}) - s_{it}^{M}(\Delta p_{it}^{m} + \Delta m_{it}) - (1 - \mu_{it} s_{it}^{l} - \mu_{it} s_{it}^{m})(\Delta r_{it} + \Delta k_{it})$$

$$= \alpha_{0} + \gamma_{i} + \tau_{t} + (1 - \frac{1}{\mu})[(\Delta p_{it} + \Delta q_{it}) - (\Delta r_{it} + \Delta k_{it})] + u_{it} \tag{2}$$

where γ_{i} denotes firm specific effects, τ_{t} year dummies, u_{it} the error term, $SR_{it} - SR_{it}^{d}$ the difference between the Solow residuals, s_{it}^{L} the labour share, s_{it}^{M} the material input share, $\Delta p_{it} + \Delta q_{it}$ the growth rate of turnover, $\Delta l_{it} + \Delta w_{it}$ the growth rate of labour costs, and $\Delta r_{it} + \Delta k_{it}$ the growth rate of nominal capital. Equation (2) will be estimated for each two-digit NACE industry, which defines the market in this study. This means that the markup ratio μ will be estimated as an average for each individual industry. Equation (2) will be estimated for the time period from 2005 to 2013, so the estimated μ will show the average markup for each industry during this timespan. Whether the markup has changed after the global financial crisis of 2009 is also tested by the addition of an interaction terms of markup and a post-crisis structural dummy to equation (2).

Equation (2) assumes that workers are paid the competitive market wage, so marginal revenue from labour equals the wage, and that workers do not have any bargaining power. As noted above this assumption has not been found to be valid in empirical studies. Crépon et al. (2005) develop a model where the price-cost markup can be estimated so that the bargaining power of workers is taken into account. It is assumed that workers bargain with the firm over employment and wages. The objective of workers is to maximise wage income $L_{it}(W_{it} - \overline{W}_{it})$, where $\overline{W}_{it}$ is the alternative wage on the external labour market, or the reservation wage. At the same time the firm's objective is to maximise short run profit $P_{it}Q_{it} - W_{it}L_{it}$. If no agreement is reached, workers get their reservation wage $\overline{W}_{it}$ and firms get no short run profits and need to bear the fixed costs of capital and material inputs. The collective objective would be to maximise the weighted average of the workers' wage income and the firm's short-run profit, and the Nash solution to the bargaining problem is as follows:

$$\max_{w_{it}, L_{it}}\left[L_{i}(W_{i} - \overline{W}_{i})\right]^{\theta_{i}}\left[P_{i}Q_{i} - W_{i}L_{i}\right]^{1-\theta_{i}} \tag{3}$$

Taking the first order condition with respect to labour and rearranging to solve for output elasticity with respect to labour gives the following:

$$\varepsilon_{it}^{L} = \mu_{i} s_{i}^{L} + \mu_{i} \frac{\theta_{i}}{1 - \theta_{i}}(s_{i}^{L} - 1) \tag{4}$$

$0 \leq \theta it \leq 1$ is a parameter that captures the bargaining power of the workers and is equal to the share of the short run profit of the firms appropriated by the workers. If $\theta it = 0$, workers have no bargaining power and equation (4) becomes equal to the specification with competitive factor markets shown in equation (1). If $\theta it > 0$, the last term in equation (4) is negative, indicating that when workers have market power to negotiate wages to a level above their reservation wage, labour output elasticity with respect to labour diminishes and changes in labour lead to smaller changes in output than in the case with perfect competition in factor markets. Substituting the new elasticity and solving for the Solow residual in the primal and dual problem as previously gives a revised specification of equation (2) where imperfect competition in the labour market is explicitly tested:

$$SR_{it} - SR_{it}^d = \alpha_0 + \gamma_i + \tau_t + (1 - \frac{1}{\mu})\big[(\Delta p_{it} + \Delta q_{it}) - (\Delta r_{it} + \Delta k_{it})\big]$$

$$+ \frac{\theta}{1-\theta}(s^L - 1)\big[(\Delta l_{it} + \Delta w_{it}) - (\Delta r_{it} + \Delta k_{it})\big] + u_{it} \tag{5}$$

If the last term in equation (5) is statistically significantly different from zero, it can be concluded that there is imperfect competition for labour in the given industry.

Data

This chapter uses the CompNet database to test equations (2) and (5) empirically. The CompNet project is a research network initiated by the European Central Bank and it applies a "distributed micro data approach" to calculate industry level indicators using firm level data. The part of the project on markups is run by the markup task group[8] that developed the codes and the methodology for the estimation. The markup task group studied accounting markups directly obtained from balance sheet and income statement data, such as a proxy for the Lerner index (see Amador et al (2016)). As a complement to this, Soares (2016) estimates the size of markups under perfect and imperfect competition in the labour market. These studies have applied the same specifications using firm-level data for almost 20 countries in Europe. This section will focus only on the level of competition in Estonia, see Soares (2016) for the results of other countries.

The biggest challenge in Roeger's (1995) approach is to derive the user cost of capital. The approach taken by the CompNet task group on markups has employed the following assumptions in order to estimate the cost of capital. The user cost of capital is defined in a similar way to that used in Soares (2016):

$$r_{it} = (i_t - \pi_t + \delta)P_t^K \tag{6}$$

where i_{it} denotes the financial costs of capital calculated as the ratio of interest payments and other financial expenses to total debt at the firm level; π_t is inflation, δ is the fixed depreciation rate of capital at 0.08; and is P_t^K the index of the price deflator of gross fixed capital formation.

Table 1 presents descriptive statistics of the variables used in the empirical testing. The dominant input share in revenues is material costs, followed by labour and capital. The average growth rate of nominal turnover is 4.3%, the growth rate of nominal capital stands at 1.7%, and growth rate of nominal labour costs is 8.8%.

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8 João Amador, Francesco Di Comite, Catherine Fuss, Jan Hagemejer, Jose Manuel Montero and Ana Cristina Soares.

Table 1. Descriptive statistics of the variables analysed, 2005-2013 (n = 146 110)

	Mean	Std. Dev.
s_{it}^{L} — labour share in revenue	0.241	0.270
s_{it}^{M} — material inputs share in revenue	0.705	0.378
s_{it}^{K} — capital share in revenue	0.054	0.492
$SR_{it} - SR_{it}^{d}$ — difference in the Solow residuals of the primal and the dual problem	-0.023	0.563
$\Delta p_{it} + \Delta q_{it}$ — growth rate of turnover	0.043	0.400
$\Delta l_{it} + \Delta w_{it}$ — growth rate of labour costs	0.088	0.416
$\Delta p_{it}^{m} + \Delta m_{it}$ — growth rate of material inputs	0.044	0.410
$\Delta r_{it} + \Delta k_{it}$ — growth rate of nominal capital costs	-0.017	0.721

Source: author's calculations from CompNet data.

Results

The results of the estimation of equations (2) and (5) are presented in Tables 2 and 3. Table 2 presents the results for manufacturing industries, Table 3 gives those for services industries. There are sizable differences in margins across industries as the hypothesis of perfect competition is not rejected for only three out of 22 industries in manufacturing, while firms in the rest of the industries possess some market power in setting prices above marginal costs. The average value of $1-1/\mu$ in manufacturing is estimated to be 0.122 and the average value of μ is equal to 1.142. Given that imperfect competition in the labour market may increase the estimated markups, the average value of $1-1/\mu$ is estimated to be 0.210 and the average value of μ is put at 1.279. This means that with imperfect competition in the labour market, firms set their prices on average 1.279 times higher than their marginal costs.

The industries with the highest markup are computer, electronic and optical products, followed by other transport equipment, and electrical equipment. The industries with high markup are on the list of high and medium-tech industries that have higher R&D expenditures and can extract market power from new innovative products (see Eurostat (2015) for the list of high-tech and medium-tech industries).

The share of short-term profits shared with employees is statistically significantly different from zero in most of the manufacturing industries; however there are seven industries where perfect competition in the labour market is not rejected. The average value of $\theta/(1-\theta)$ is estimated to be 0.140 and the average value of θ to be 0.119. This implies that workers have on average 12% of short-term profits shared with them. In most of the cases the high markup coincides with high bargaining power for workers; their bargaining power is the highest in computer, electronic and optical products, followed by other transport equipment and furniture. Soares (2016) discusses why markups and the bargaining power of workers are positively correlated; first, higher markups create an opportunity for workers to extract a higher share of profits; and second, high bargaining power of workers makes some firms exit the market, leading to reduced competition.

Lastly it is tested whether markups and the bargaining power of workers have changed since the global financial crisis in 2009. The last two columns with regression coefficients in Table 2 report the interac-

2-digit NACE sector		Competitive labour market	Labour market with imperfect competition				Observations
		Without structural break	Without structural break		With structural break since 2009		
		$1-1/\mu$	$1-1/\mu$	$\theta/(1-\theta)$	$2009\times(1-1/\mu)$	$2009\times\theta/(1-\theta)$	
10	Food products	0.083***	0.192***	0.145***	-0.013	-0.046	1474
11	Beverages	0.070***	0.079	0.012	-0.247*	-0.178	106
13	Textiles	0.101***	0.169***	0.116***	0.005	-0.016	625
14	Wearing apparel	0.121***	0.192***	0.151***	0.060*	0.060	1427
15	Leather and related products	0.142***	0.193***	0.085	-0.179**	-0.411***	234
16	Wood and products of wood	0.103***	0.202***	0.150***	-0.073***	-0.118***	3320
17	Paper and paper products	0.116***	0.219***	0.143***	-0.106	-0.137	252
18	Printing and reproduction of media	0.148***	0.226***	0.115***	-0.024	-0.044	1076
20	Coke and refined petroleum	0.150***	0.185**	0.047	-0.250	-0.155	248
21	Pharmaceuticals	0.027	0.088	0.093	-0.536***	-0.598**	57
22	Rubber and plastic products	0.136***	0.171***	0.049*	0.110**	0.169***	724
23	Other non-metallic mineral products	0.153***	0.173***	0.032	-0.119**	-0.142**	685
24	Basic metals	0.241	0.407	0.254	0.303	0.664	92
25	Fabricated metal products	0.137***	0.239***	0.155***	-0.008	-0.029	3368
26	Computer, electronic and optical products	0.197***	0.349***	0.304***	0.116	0.025	392
27	Electrical equipment	0.136***	0.274***	0.201***	-0.206***	-0.191**	348
28	Machinery and equipment n.e.c.	0.061***	0.188***	0.197***	0.013	0.112	530
29	Motor vehicles, trailers	0.038	0.071*	0.049	0.269*	0.267	201
30	Other transport equipment	0.134***	0.296***	0.266***	0.182	0.166	206
31	Furniture	0.098***	0.231***	0.206***	-0.079***	-0.074*	1776
32	Jewellery, musical instruments, toys	0.148***	0.239***	0.148***	0.011	0.041	736
33	Repair and installation of machinery	0.144***	0.244***	0.157***	-0.032	-0.050	1689
No of sectors where perfect competition cannot be rejected		3	3	7	12	15	
Share of sectors where perfect competition cannot be rejected		13.6	13.6	31.8	54.5	68.2	
Non-weighted average of coefficients		0.122	0.210	0.140	-0.037	-0.031	
Non-weighted average of μ or θ		1.142	1.279	0.119			
Turnover weighted average of μ or θ		1.142	1.286	0.126			

Source: authors' calculations from the CompNet data.

tion terms of markup and rent sharing with a structural dummy that has values of one in 2009 and later and zero otherwise. There are only a minority of industries where competition in the product and labour markets has statistically significantly changed since 2009 and if there has been a change in the competitive environment, it has usually been in the direction of tighter competition. The interaction terms are also often unreliably large because of the small number of observations in the industry, and for example

the large changes in the competitive environments in leather products and in pharmacy can be considered unreliable because of this. Competition has become stronger and markups lower in the production of beverages, wood products, other non-metallic mineral products, electrical equipment and furniture. There are also industries where competition has become weaker and markups have increased such as the production of wearing apparel, rubber and plastic products and motor vehicles and trailers. In most cases the change in markup coincides with a change in workers' bargaining power.

Table 3 presents the same results for the services industries. The level of competition is on average lower in services than in manufacturing and estimated markups are higher. This finding from Estonian data is in line with the empirical findings from other countries (see e.g. Soares (2016)). The cross industry average value of μ is 1.227 for the case with perfect competition in the labour market and 1.410 for the case with imperfect competition in the labour market. The number of industries for which perfect competition was not rejected is even lower than in manufacturing, at two out of 33 industries. The share of industries for which perfect competition in the labour market was not rejected is also very small, at five out of 33 industries. The average value of θ in services is 0.128, which is also slightly higher than in manufacturing, where it was 0.119. It can be concluded that competition is tougher in the average manufacturing industry, markups are lower and the bargaining power of workers is weaker. However, this does not hold for weighted average values as the weighted averages for μ and θ are substantially lower in services, indicating that larger services industries such as wholesale and retail sales usually have tougher competition.

The services industries with the highest markups are programming and broadcasting, real estate, and activities of head offices and management services. Programming refers not to computer programming but to radio and TV programming and broadcasting. The two industries with the highest markup other than real estate activities are on the list of knowledge-intensive services (see Eurostat (2015) for the list). Services industries where workers have the highest bargaining power are water transport, other professional, scientific and technical activities, and civil engineering. Water transport and professional business services are again on the list of knowledge-intensive services, while construction industries are not listed in these knowledge-intensiveness indicators.

There are more services industries than manufacturing industries where markups and the bargaining power of workers have changed statistically significantly since the global financial crisis. Again the change has mostly been negative, like in manufacturing, and moving towards tighter competition. The small number of observations means it must be emphasised that, as above, some estimates of interaction terms are unreliable, so the estimates of interaction effects in postal services and research and development for example cannot be considered to be reliable.

The results in terms of product and labour market competition in Estonia are quite similar to the findings from the data of other Central and Eastern European (CEE) countries; see e.g. Marinov (2010) and Soares (2016). Soares (2016) reports the markups using the same methodology as in this section but taking the whole sample of the CompNet project, a total of 11 countries. She finds that profit margins and the bargaining power of workers are lower in CEE countries than in Western Europe, while Estonia is positioned in the middle of the CEE group.

Table 3. Markups in services industries in Estonia, 2005-2013

2-digit NACE sector		Competitive labour market	Labour market with imperfect competition				Observations
		Without structural break	Without structural break		With structural break since 2009		
		$1-1/\mu$	$1-1/\mu$	$\theta/(1-\theta)$	$2009\times (1-1/\mu)$	$2009\times \theta/(1-\theta)$	
41	Construction of buildings	0.118***	0.181***	0.108***	-0.060***	-0.119***	7986
42	Civil engineering	0.173***	0.328***	0.259***	-0.022	-0.034	2138
43	Specialised construction	0.144***	0.238***	0.151***	-0.041***	-0.058***	11059
45	Wholesale and retail trade of motor vehicles	0.056***	0.138***	0.107***	-0.052***	-0.038**	6000
46	Wholesale trade, except of motor vehicles	0.072***	0.145***	0.094***	-0.057***	-0.029***	14923
47	Retail trade, except of motor vehicles	0.044***	0.136***	0.117***	-0.077***	-0.071***	11730
49	Land transport and transport via pipelines	0.157***	0.288***	0.180***	-0.040***	-0.049***	11336
50	Water transport	0.048	0.333**	0.362**	-0.386	-0.183	107
51	Air transport	0.222	0.539	0.439	-0.010	0.252	34
52	Warehousing and support for transportation	0.114***	0.150***	0.057***	0.028	0.048	3133
53	Postal and courier	0.076**	0.088*	0.017	0.436***	0.261***	155
55	Accommodation	0.272***	0.403***	0.229***	-0.125**	-0.164**	1609
56	Food and beverages service	0.051***	0.191***	0.204***	-0.062***	-0.069**	4595
58	Publishing	0.094***	0.180***	0.128***	-0.122**	-0.115	757
59	Motion picture, video, television production	0.284***	0.390***	0.180***	0.145*	0.023	675
60	Programming and broadcasting	0.393***	0.405***	0.014	0.048	-0.320	119
61	Telecommunications	0.132***	0.238***	0.146***	0.017	-0.005	405
62	Computer programming, consultancy	0.237***	0.356***	0.208***	-0.040	0.004	3140
63	Information services	0.200***	0.216***	0.029	0.010	-0.070	604
68	Real estate	0.359***	0.456***	0.149***	-0.172***	-0.191***	7619
69	Legal and accounting activities	0.234***	0.316***	0.142***	-0.043**	-0.077***	6353
70	Head offices; management consultancy	0.351***	0.427***	0.135***	-0.290***	-0.271***	2996
71	Architectural and engineering; technical testing and analysis	0.251***	0.318***	0.149***	-0.167***	-0.249***	4445
72	Scientific research and development(a	0.197**	0.012	-0.338***	0.836***	1.315***	255
73	Advertising and market research	0.145***	0.249***	0.151***	-0.014	0.023	2103
74	Other professional, scientific and technical activities	0.232***	0.376***	0.266***	-0.123***	-0.154***	2389
75	Veterinary	0.116***	0.203***	0.114***	-0.103	-0.059	274
77	Rental and leasing	0.314***	0.380***	0.108***	-0.213***	-0.179***	1689
78	Employment activities	0.191***	0.262***	0.139***	-0.016	-0.002	977
79	Travel agency, tour operator reservation service	0.086***	0.141***	0.077***	-0.083*	-0.100**	895
80	Security and investigation	0.106***	0.135***	0.054	0.114**	0.302***	378
81	Services to buildings and landscape	0.157***	0.240***	0.149***	0.016	-0.060	2194
82	Office administrative and support	0.111***	0.282***	0.249***	0.075	-0.049	957
No of sectors where perfect competition cannot be rejected		2	2	5	13	15	
Share of sectors where perfect competition cannot be rejected		6.1	6.1	15.2	39.4	45.5	
Non-weighted average of coefficients		0.173	0.273	0.153	-0.045	-0.056	
Non-weighted average of μ or θ		1.227	1.410	0.128			
Turnover weighted average of μ or θ		1.124	1.251	0.106			

Source: author's calculations from the CompNet data.
Note: a) Excluded from the calculation of average values for services because of extreme value for the bargaining power of workers.

Abraham et al. (2009) show that import competition from low wage countries and outsourcing has reduced markups and union bargaining power in Belgium. The bargaining power of workers is also related to union density and coverage, and to employment protection legislation.

Given that import penetration is very high in Estonia and that union density is the lowest in Europe, it is surprising that the bargaining power of workers is estimated to be relatively high in Estonia. Their bargaining power is estimated to be at a similar level in countries like Slovakia and Slovenia, but in these countries around one quarter or one third of workers are union members, while in Estonia less than 10% of workers are members of unions. Factors such as distortions due to the scale effect of the small labour market, skill mismatches, and easy access to jobs in the external labour market in Finland could explain the relatively strong bargaining power of Estonian workers. All these factors deserve attention in future studies on markups and rent-sharing in Estonia.

Finally, in order to understand the dynamics of the markups better, we have also calculated an accounting Lerner index that allows markups to be estimated at the yearly frequency. The accounting Lerner index is calculated as turnover minus variable costs divided by turnover (see Amador et al. (2016) for more details). The results for manufacturing and services are plotted on the Figure in Appendix 1. The markups of manufacturing were consistently higher than those of services before 2003, the boom years of 2004-2007 witnessed higher markups in services than in manufacturing, and then the recession hit the markups in services especially hard. The post-crisis markups have been more or less the same in services and in manufacturing. These findings overlap with the evidence of the boom-bust cycle in capital inflows and domestic demand. There was a surge in capital inflows and a boost to domestic demand after the EU accession in 2004, before both of the indicators reversed to busts in 2009 (see e.g. Bakker and Gulde (2010)). The high pre-EU accession markups in tradables can be related to higher productivity premiums from exporting, which are usually typical of countries with a lower income level (ISGEP (2008)).
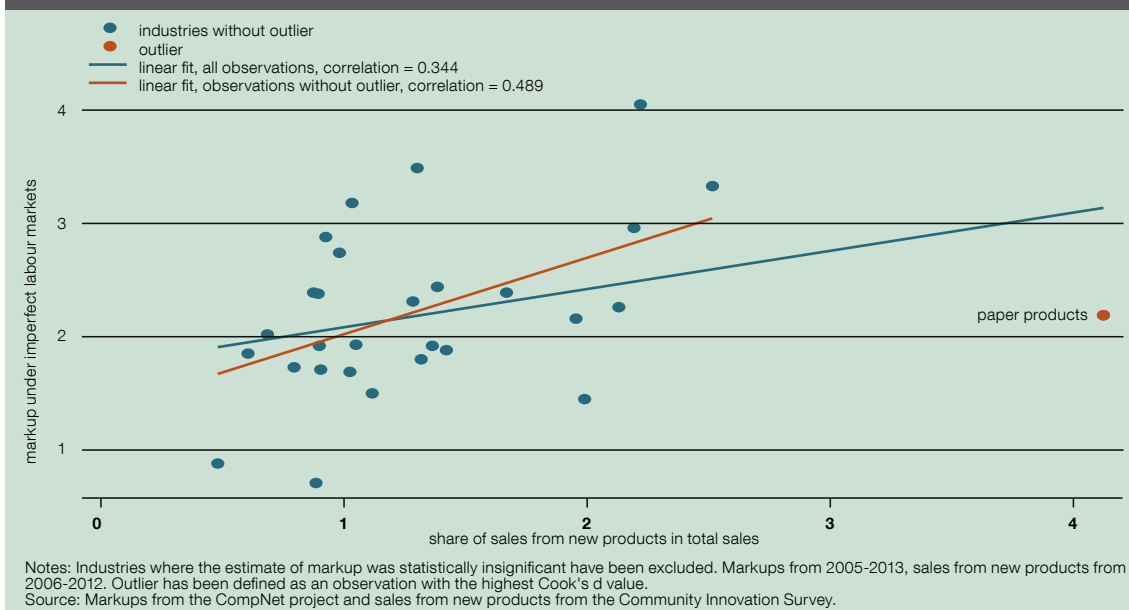
Summary

This section estimated markups and the bargaining power of workers in Estonian manufacturing and services industries. The level of competition in Estonia seems to be at the average level of the other Central and Eastern European countries. In order to validate our markup estimates, the markups have been correlated with another measure of firms' market power, the success of their innovation projects. Figure 1 plots the scatter diagram of industry-level markups and the share of new products in sales from the Community Innovation Survey. The two indicators are positively correlated, which implies that industries where firms have a higher share of sales from new products also tend to have higher markups. We do not imply causality here, but the results confirm that in a very rough sense we seem to be measuring similar phenomena.
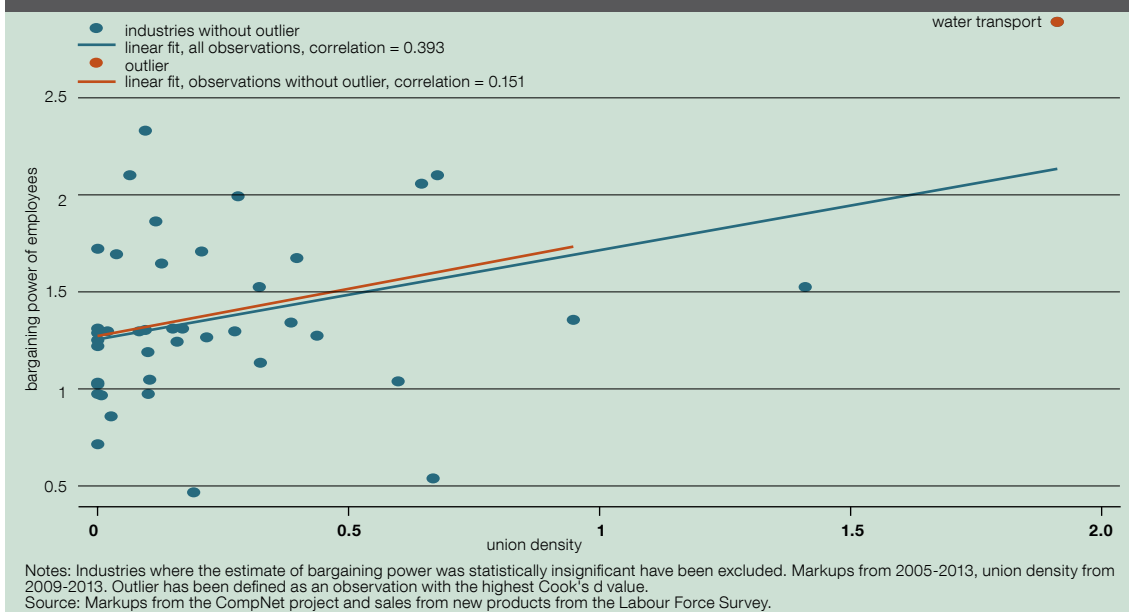
It is also shown that it is important to take into account the rent-sharing of profits with workers in the estimation of markups, as the markups become higher after the assumption of perfect competition in the labour market is relaxed. Workers obtain 12-13% of the short-term profits in the manufacturing and services sectors as wage premiums on top of their reservation wage or alternative wage. Figure 2 plots at the industry level the estimate of workers' market power and average union density in the industry as another validation exercise. We would expect the industries with higher union density to have higher bargaining power for workers as well. The correlation is less clear than in the previous figure as there

are many industries with no or very low union density, but with variable bargaining power of workers. This indicates that there can be various sources of bargaining power for workers such as shortages of skilled workers in some industries or the outside option for workers of going to foreign labour markets.

Figure 16. Industry-level share of sales from new products and markups in Estonia.

- industries without outlier
- outlier
- linear fit, all observations, correlation = 0.344
- linear fit, observations without outlier, correlation = 0.489

markup under imperfect labour markets

paper products

share of sales from new products in total sales

Notes: Industries where the estimate of markup was statistically insignificant have been excluded. Markups from 2005-2013, sales from new products from 2006-2012. Outlier has been defined as an observation with the highest Cook's d value.
Source: Markups from the CompNet project and sales from new products from the Community Innovation Survey.

Figure 17. Industry-level union density and markups in Estonia.

water transport

- industries without outlier
- linear fit, all observations, correlation = 0.393
- outlier
- linear fit, observations without outlier, correlation = 0.151

bargaining power of employees

union density

Notes: Industries where the estimate of bargaining power was statistically insignificant have been excluded. Markups from 2005-2013, union density from 2009-2013. Outlier has been defined as an observation with the highest Cook's d value.
Source: Markups from the CompNet project and sales from new products from the Labour Force Survey.

In sum, it has been found that the hypothesis of perfect competition is not rejected in only a minority of industries, for 14% of two-digit NACE industries in manufacturing and for 6% of industries in services. The level of competition has been found to be tighter in traditionally tradable manufacturing industries than in usually non-tradable services industries. An average industry sets prices 1.28 times higher than marginal costs in manufacturing and 1.41 times higher than marginal costs in services. The bargaining power of Estonian workers is quite high despite the stiff competition from imports and the low union power in Estonia.

There are also some industries where the level of competition has changed in the aftermath of the global financial crisis; in most of these industries competition has become tougher and this more frequently concerns services industries.

Appendix 1. Accounting Lerner index in Estonia, manufacturing vs services, 1995-2013.

Figure 18. Across sectors average Lerner index, 1995-2013.
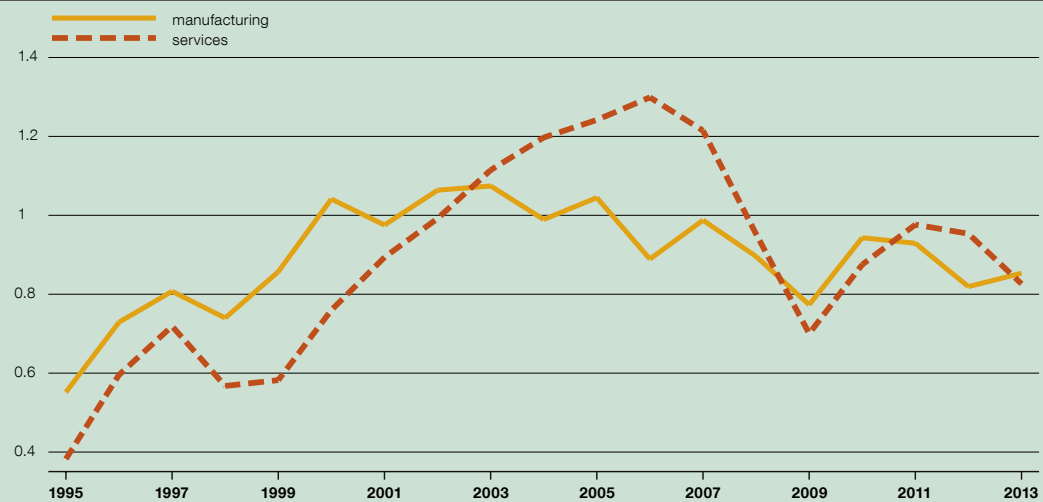
Source: CompNet database, authors' calculations.
Note: Services industries cover construction and business services. The accounting Lerner index is derived as the share of turnover minus labour and material costs in turnover. The industry value is found as the turnover weighted average of firm-level Lerner indexes. The industry with the lowest and the highest Lerner index in each year has been trimmed first and then the cross-industry unweighted average is calculated.

References

Abraham, F.; Konings, J.; Vanormelingen, S. (2009) The effect of globalization on union bargaining and price-cost margins of firms. Review of World Economics, 145, 13-36.

Amador, J., A.; Di Comite, F.; Fuss, C.; Hagemejer, J.; Montero, J. M.; Soares, A. C. (2016) Price-cost margin dynamics and heterogeneity: Evidence from European firm-level data. Forthcoming in ECB Working Paper Series.

Amador, J., A.; Soares, A. C. (2014) Competition in the Portuguese economy: Estimated price-cost margins under imperfect labour markets. ECB Working Paper Series, no 1751.

Bakker, B., B.; Gulde, A.-M. (2010) The Credit Boom in the EU New Member States: Bad Luck or Bad Policies? IMF Working Paper WP/10/130.

Competitiveness and the export performance of the euro area. (2006) ECB Monthly Bulletin. July 2006, 69–79.

Crépon, B, Desplatz, R.; Mairesse, J.; Desplatz, R. (2005) Price-Cost Margins and Rent Sharing: Evidence from a Panel of French Manufacturing Firms. Annales d'Économie et de Statistique, 79/80, 583-610.

Dobbelaere, S. (2004) Estimation of price-cost margins and union bargaining power for Belgian manufacturing. International Journal of Industrial Organization, 22, 1381– 1398.

Ellis, L. (2001) Measuring the real exchange rate: pitfalls ad practicalities. Reserve Bank of Australia Research Discussion Papers. 2001, no 4.

European Commission (2010). Quarterly Report on the Euro Area. Vol. 9 (2), 7-18.

Eurostat (2015) Eurostat indicators on High-tech industry and Knowledge - intensive services [http://ec.europa.eu/eurostat/cache/metadata/DE/htec_esms.htm]

The Global Competitiveness Report 2014-2015. (2015) World Economic Forum. http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf

Hall, R. (1988) The Relation between Price and Marginal Cost in U.S. Industry. Journal of Political Economy, 96(5), 921-947.

Hubrich. K.; Karlsson, T. (2010) Trade consistency in the context of the Eurosystem projection exercises. ECB Occasional Paper Series, no 108.

ISGEP (2008) Understanding Cross-Country Differences in Exporter Premia: Comparable Evidence for 14 Countries. Review of World Economics, 144(4), 596-635.

Klau, M; San Sau Fung.(2006) The new BIS effective exchange rate indices. BIS Quarterly Review. March 2006, 51-65.

Lopez-Carcia et al. (2014) Micro-based evidence of EU competitiveness: the CompNet database. ECP Working Paper no. 1634.

Marinov, R. (2010) Competitive Pressure in Transition: A Role for Trade and Competition Policies? Journal of Industry, Competition and Trade, 10, 1-31.

OECD (2015), OECD Economic Surveys: Estonia 2015, OECD Publishing, Paris.DOI: http://dx.doi.org/10.1787/eco_surveys-est-2015-en

Republic of Estonia. Selected issues. (2015) Estonia: income convergence and medium-term growth potential. IMF Country Report No. 15/337.

Roeger, W. (1995) Can Imperfect Competition Explain the Difference between Primal and Dual Productivity Measures? Estimates for U.S. Manufacturing. Journal of Political Economy, 103(2), 316-330.

Schmitz, M.; De Clercq, M.; Fidora, M.; Lauro, B.; Pinheiro, C.. (2012) Revisiting the effective exchange rates of the Euro. (2012). ECB Occasional Paper Series, no 134.

Soares, A., C. (2016) Price-cost margin and bargaining power: A cross-country analysis using firm-level data. Forthcoming in ECB Working Paper Series.

Team of the Working Group on Econometric Modelling of the European System of Central Banks. (2012). Competitiveness and external imbalance within the Euro Area. (2012). ECB Occasional Paper Series, No 139.