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Tradable vs. Non-tradable:
An empirical Approach to the Classification of Sectors

Abstract:

Disaggregating economic indicators into 'tradable' and 'non-tradable' is hampered by the problem of allocating individual business sectors to either one or the other. Moreover, it overlooks the important role some non-tradable inputs play for exports and competitiveness. This note proposes to instead weight sectors according to their export intensity based on newly available data. In order to illustrate the approach, it looks at 'traded' and 'non-traded' ULCs for several vulnerable countries.

1. The problem

Euro area rebalancing has reinvigorated the monitoring of activity in 'tradable' vs. 'non-tradable' business sectors. Such analysis is usually rests on dividing the economy into a tradable and a non-tradable part according to broad economic sector. For instance, manufacturing or transport is usually regarded as tradable, while electricity generation is not. Depending on the sectorial details, such distinctions tend to overlap, but do not match across analyses from different authors, institutions or countries. This is partially because the 'tradability' of broad sectors varies among economies. Much of the restaurant sector in Austria is geared towards international tourism, while restaurants in Lithuania do hardly matter for its exports. Electricity in Luxembourg is much traded while electricity in Ireland is not. However, electricity is an important input to Irish exports. In contrast, Cypriot exports seem less energy-intensive and thus less dependent on activity in domestic electricity generation. Depending on the viewpoint, it is thus difficult to classify some sectors as either tradable or non-tradable.

The traditional approach of dividing sectors into tradable and non-tradable faces similar issues at each level of aggregation. For instance, restaurants in the tourist areas of an economy may be very important for competitiveness and generating export revenue, while similar restaurants in non-tourist areas are much less so. Similarly, the size distribution of firms within a sector might affect its capacity to export (small manufacturing firms usually participate less in exports).

2. A solution

It is more appropriate to consider the export intensity of each sector rather than classifying all of it as tradable or non-tradable, accounting also for intermediate inputs from non-exporting firms.[1] This is important because non-exporting firms often provide important inputs to export revenue. Other firms are characterized by importing most of the inputs for their exports, etc. Only input-output analysis can account for all such trade of intermediate goods and services between sectors and across borders. The resulting data allows to determine what part of value added in each sector eventually (after transformation by the value chain) serves foreign demand, and what part is destined to domestic final demand. The share of value added embodied in foreign demand (VAiFD), *i.e.* value added that is exported, thus details by how much sectorial output will rise in response to a marginal increase in foreign demand (while keeping the sectorial composition of the economy constant). For each country and sector, the share of VAiFD thus provides the 'export intensity' of value added. This empirical export intensity not only shows in how far output is embodied in exports, but it also proxies the output of the economy that is tradable. In view of value chains and input-output mechanisms, any sector provides some tradable value added (*e.g.* sewage providers via enabling the manufacturing of exports according to environmental standards). Moreover, being a number between 0 and 1, the share of VAiFD is likely a more robust estimate of this 'tradable' value added then the dichotomist separation of sectors by NACE/ISIC code.

So far, efforts to use a finer distinction of tradable and non-tradable sectors have been hampered by a lack of data. However, the TIVA data set, published Feb. 2013,[2] uses world

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[1] This approach is inspired by, but conceptually different from Gächter, M., Lorenz, H., Ramskogler, P., Silgoner, M. (2013): 'An export based measure of cost competitiveness,' *Monetary Policy and the Economy*, 2, which propose to compute tradable ULCs based on sectorial exports.

[2] OECD & WTO: Trade in value added, http://oe.cd/tiva , based on World Input-Output Tables.

input-output tables to calculate the value added embodied in foreign demand for each country and over 30 sectors (for 2004, 2005, and 2009). Such data enables a meaningful disaggregation of economic activity according to VAiFD shares.

3. The concept

Traditional tradable vs. non-tradable analysis divides economic activity into sectors. For example, 'tradable value added' Y^T is defined as the value added from sectors i Y_i that are designated as tradable:

$$Y^T = \sum_i Y_i \, \omega_i \quad \text{where} \quad \omega_i = \begin{cases} 1 \text{ if } i \text{ defined as 'tradable'} \\ 0 \text{ if } i \text{ defined as 'non-tradable'} \end{cases} \quad (1)$$

Composite indicators are defined in the same vein: *e.g.* unit labour cost in tradables (ULC^T) is defined as the ratio of employee compensation (W_i) and real value added (Y_i) in the tradable sectors.[3] Unit labour cost in the non-tradable sector (ULC^{NT}) is defined correspondingly. Any other composite indicators follow the same pattern.

$$ULC^T = \frac{\sum_i W_i \omega_i}{\sum_i Y_i \omega_i} \quad ULC^{NT} = \frac{\sum_i W_i(1 - \omega_i)}{\sum_i Y_i(1 - \omega_i)} \quad (2)$$

This note proposes to forgo the binary classification of sectors, and instead use weights representing each sector's 'traded' output. In order to do that, note that value added in sector i Y_i can be divided into two components. Y_i^X is the value added embodied in foreign demand, *i.e.* the value added of sector i that directly or indirectly serves to provide exports (after accounting for re-imports and other inter-sectorial and international interactions). The remaining part of sector i's value added is embodied in domestic demand Y_i^D. Thus for each sector, the share of value added embodied in foreign demand may be defined as $\bar{\omega}_i$:

$$Y_i = Y_i^X + Y_i^D \qquad \bar{\omega}_i \equiv \frac{Y_i^X}{Y_i} \quad (3)$$

Computing aggregate indicators based on traded and non-traded value added shares follows the same logic as equations (1) and (2), but replaces the binary weights ω_i with the continuous weights $\bar{\omega}_i \in [0,1]$.

4. The data

Table 1 reports the shares of value added embodied in foreign demand for the seven broad sectors found in the AMECO database.[4] The figures show that different sectors in smaller and more open economies usually display a higher share of value added (VA) destined for foreign demand, compared to the corresponding sectors in large and more closed countries. For instance, 87% of agricultural output in the Netherlands ultimately (after processing etc.) satisfies foreign demand, while the same holds true for only 17% of Greek agricultural VA. Most of manufacturing output in the smaller neighbours of Germany

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[3] Note that this note employs a simplified version of unit labour cost, also known as 'unit wage cost'or 'wage share'. The proper definition ULC accounts for the number of self-employed, which are not available with sectorial data.

[4] These figures are computed on the basis of more detailed data from the TiVA project.

eventually ends up with foreign demand due to value chain integration, with a still high number of 58% in the German case. In contrast, the share of manufacturing output embodied in foreign demand is only 46% for Italy and 40% for Spain. In the new Member States that are characterized by important FDI inflows, more than 10% of construction VA actually serves as an input to satisfy foreign demand.

**Table 1: Share of value added embodied in foreign demand by broad sector (2009)**

Sector	Agriculture & fishing	Mining & utilities	Manufactu-ring	Construction	Trade, hotels, transport & similar	Financial & real estate	Public & social services	All sectors
ISIC code	A,B	C,E	D	F	G,I	J,K	L-P	Total
BE	77	21	88	11	37	32	5	33
CZ	46	30	72	13	33	23	7	34
DK	55	38	86	5	36	19	4	27
DE	28	18	58	5	22	23	5	24
EE	75	40	87	14	47	34	5	39
IE	100	32	75	2	43	74	6	49
EL	17	13	28	2	25	8	2	14
ES	30	15	40	2	14	22	4	15
FR	43	13	52	2	16	15	3	16
IT	18	17	46	4	16	14	2	16
LU	80	52	94	10	60	83	15	61
HU	48	21	88	10	38	31	8	38
NL	87	52	73	5	27	26	5	28
AT	37	29	73	11	27	27	4	30
PL	29	27	65	12	24	19	5	26
PT	25	22	52	4	20	18	2	18
SI	28	31	80	12	36	22	4	33
FI	21	20	57	4	26	24	5	24
SE	40	31	68	6	28	36	5	29
UK	21	25	57	3	14	27	4	20

Aggregation based on OECD TiVA weights for 2009, aggregated with Ameco data.
Note: Using a differing source for aggregation might skew the weights to some extent, in particular for sectors with low shares in the economy. For instance, the table reports 100% share of VAiFD in the case of Irish agriculture, which is likely due to revisions to Irish VA data in 2009 that were not reflected in the TiVA database.

The total VA embodied in foreign demand reflects the openness of the various economies. The numbers are broadly smaller (and more homogeneous) than traditional proxies for openness such as export intensity (Graph 1), and the ranking of countries in terms of their openness in some cases changes when shifting from one indicator to the other. The aggregate level of VAiFD (which is the scalar product of sectorial shares in total VA and sectorial VA shares) mainly reflects the differing openness of individual sectors. However, preliminary inspection of time series suggests that the change in aggregate VAiFD is more due to changes in sectorial composition, than due to changes in individual sector openness.

Graph 1: VA embedded in foreign demand vs. export intensity, 2009

Exports of goods and services, % of GDP
Value added in foreign demand, all sectors, 2009
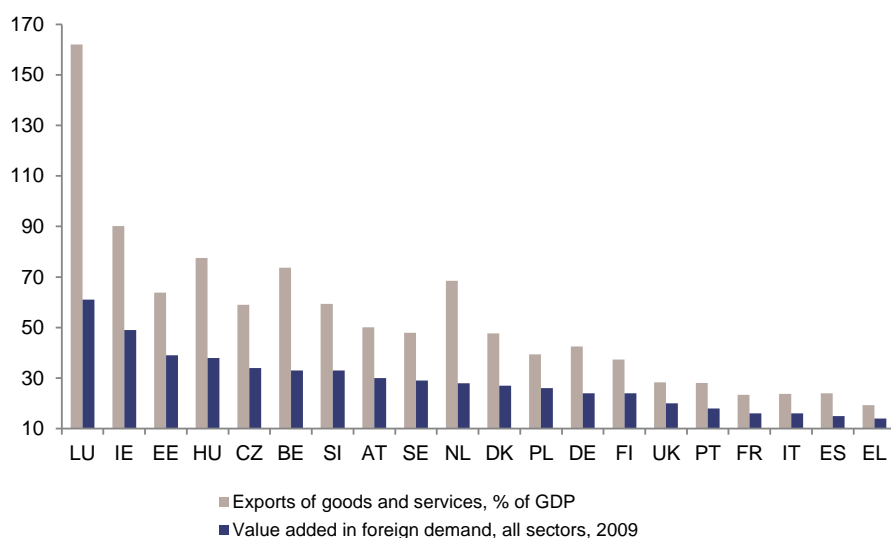
Data source: AMECO, OECD

5. Illustration: Tradable and non-tradable ULC

The weighting scheme described above might be applied to any indicator on tradable vs. non-tradable economic activity. As an illustration, consider ULC: Graph 2 (left panel) shows the ULC growth rates in tradable and non-tradable sectors according to the traditional dichotomy used in AMECO.[5] In contrast, the right panel shows 'traded' and 'non-traded' ULC growth rates when the weights from Table 1 are used.[6] For the sake of easier comparison, Graph 3 shows the figures based on the 'traditional' approach and those based on the shares of value added embedded in foreign demand next to one another for both sectors individually.

The results show that, while for many countries the absolute growth rates of sectorial ULC based on these two approaches are not fundamentally different, the discrepancies can be rather substantial. The largest differences between the two concepts arise in new Member States: According to the TiVA concept, traded ULC stagnated in most of them since 2007, while non-traded ULC are on the rise (the major exception being Hungary).[7] As another example, the results from the new concept offer a somewhat more encouraging view on sectorial rebalancing in Spain: between 2009 and 2011, the ULCs in the non-tradable sector declined more than implied by the traditional AMECO decomposition, indicating a greater correction of the pre-crisis increases. At the same time, it should be noted that traded ULC have still come down more than non-traded ULC. In Italy, the traditional decomposition attributes a larger part of the ULC increase since 2007 (or 2009) to the tradable sector (Graph 2, left panel). In contrast, the TiVA-based decomposition shows that ULCs in both sectors have behaved quite similarly during the crisis. German ULCs in the non-traded sector seem to

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[5] The AMECO database conventionally classifies the NACE sectors A_E, G_I (agriculture and fishing, mining and utilities, manufacturing, trade, hotels, communications) as tradable, while sectors F, J_P (construction, finance and business services, market services, other service activities) are considered as non-tradable.

[6] Note that disaggregating the economy into only 7 broad sectors might yield different results than a more disaggregated approach. Still, as long as within-sector variation of aggregates is not much larger than across sectors, the 7-sector aggregation is already a good proxy of what may be found with more disaggregated data.

[7] Note that ULCs in Graph 2 are computed on figures in local currency.

rise slower than suggested by the traditional decomposition – which tends to go against what would be expected from a country with a large surplus.

The differences between the two concepts tend to be more apparent when looking at the contributions from both traded and non-traded sectors to overall ULC growth (Graph 4). The TiVA-based decomposition shows that the contribution of non-tradable sectors to overall ULC growth between 2000 and 2007 was even more pronounced than indicated by the traditional decomposition. In particular, Spain and Italy show a much lower contribution from the traded sector than under the traditional decomposition. Moreover, the data shows that the Spanish ULC decline since 2009 stems mostly from the non-traded sector (in contrast to figures from the traditional decomposition).

6. Caveats

There are three technical caveats to the use of the data as presented in this note:

First, and most importantly, the value added embodied in foreign demand (VAiFD) from the TiVA data set is only available for three years, with the most recent year being 2009. This is due to the long time lags involved in constructing input-output tables. However, preliminary inspection suggests that the relative structure of VAiFD shares between sectors are relatively stable over time, and tend to have a strong common component. The VAiFD shares for missing years (and in particular recent years) can thus be estimated and extrapolated on the basis of (sectorial) export data. Moreover, decompositions of indicators into sub-sectors often rely on keeping sectorial shares constant in order to filter shift-share effects. If such an approach is used, then constant VAiFD shares (based on a single year) should be used as well and the limited time coverage is not an issue.

Second, the 'traded' and 'non-traded' indicators presented in this note are based on a very broad disaggregation of output into seven business sectors. (The choice of AMECO is mainly due to it providing more recent data than other, more detailed, databases). A finer disaggregation could provide better results. However, even the broad approach used here already holds useful insights, and will proxy a more detailed disaggregation well if intra-sectorial variation of indicators is less important than inter-sectorial variation.

Third, the TiVA data set used is currently available only for OECD countries (which omits several new EU Member States). In order to overcome this issue, the data for non-OECD EU members could be estimated using the world input-output tables. Such an approach would also allow for computing VAiFD shares going back to 1995. Alternatively, one might wait until more detail is available from the TiVA project.
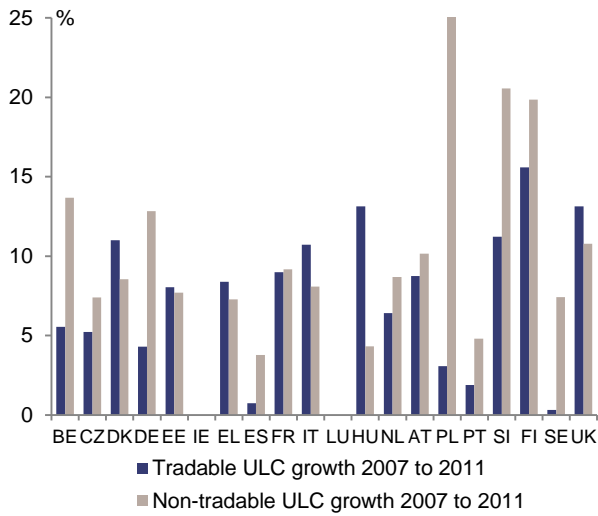

7. Conclusions

This note proposes to complement the traditional dichotomy of 'tradable' and 'non tradable' sectors in the analysis of sectorial rebalancing with a more flexible approach based on value added that is actually traded. This approach relies on new data to establish in how far each sector serves foreign (as opposed to domestic) final demand. Basing the computation of indicators on such data resolves disputes about whether sectors are 'tradable' or 'non-tradable' and should be inherently more robust than the 'traditional' approach. Computing ULC decompositions based on such a distinction between 'traded' and 'non-traded' output for EU countries broadly confirms the reading from the 'traditional' approach. But for some vulnerable countries in particular, such 'traded' and 'non-traded' figures are more
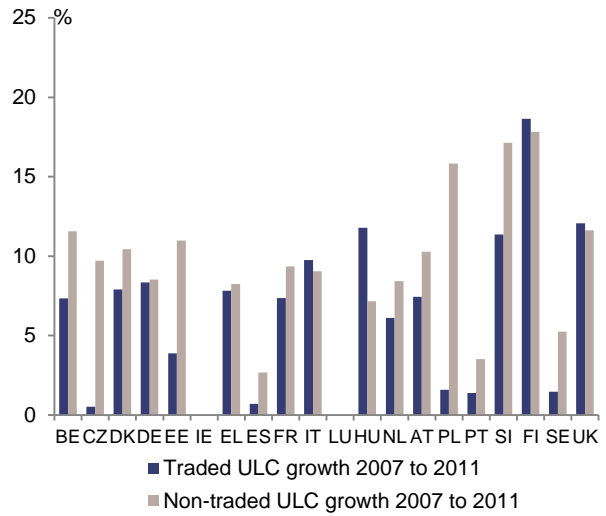
consistent with sectorial rebalancing than what is implied by the 'traditional' approach. Using value added shares to decompose into traded and non-traded output is, however, not limited to ULC. In principle any such decomposition may be refined with the newly available data in a straightforward manner.

Graph 2: ULC growth rates in tradable and non-tradable sectors, based on value added shares (right panel) vs 'traditional' Ameco concept (left panel)
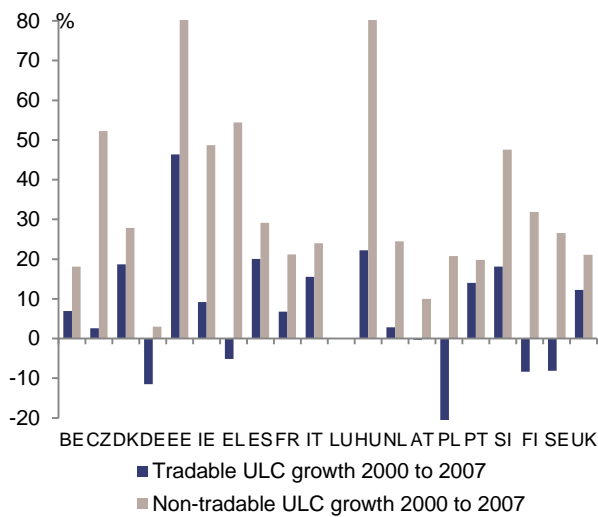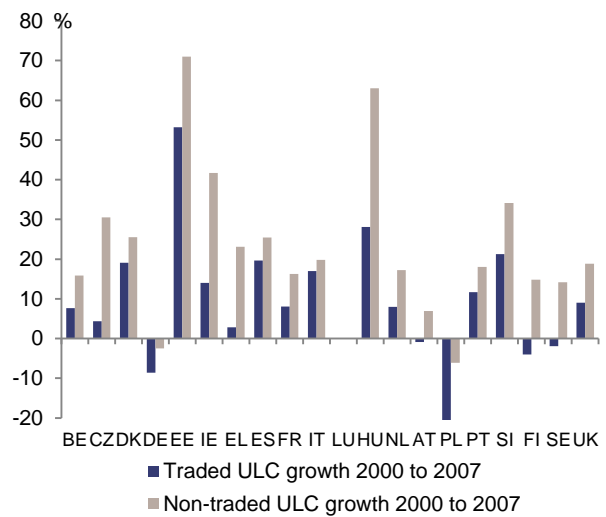
2007-11: 'Traditional' tradable ULC

- Tradable ULC growth 2007 to 2011
- Non-tradable ULC growth 2007 to 2011

2007-11: Traded ULC growth, VA shares

- Traded ULC growth 2007 to 2011
- Non-traded ULC growth 2007 to 2011

2000-07: 'Traditional' tradable ULC

- Tradable ULC growth 2000 to 2007
- Non-tradable ULC growth 2000 to 2007

2000-07: Traded ULC growth, VA shares

- Traded ULC growth 2000 to 2007
- Non-traded ULC growth 2000 to 2007

2009-11: 'Traditional' tradable ULC

- Tradable ULC growth 2009 to 2011
- Non-tradable ULC growth 2009 to 2011

2009-11: Traded ULC growth, VA shares

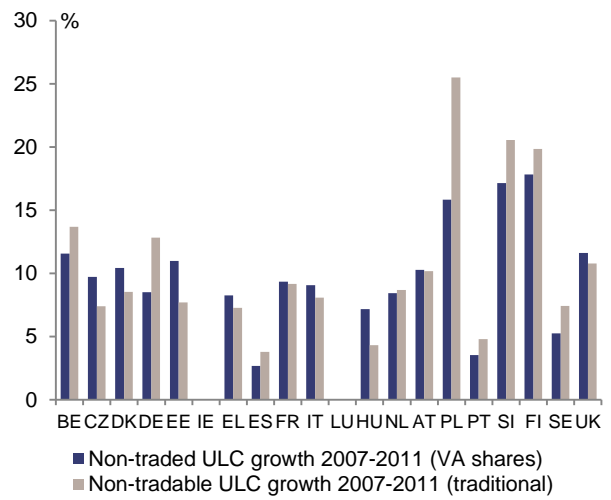- Traded ULC growth 2009 to 2011
- Non-traded ULC growth 2009 to 2011
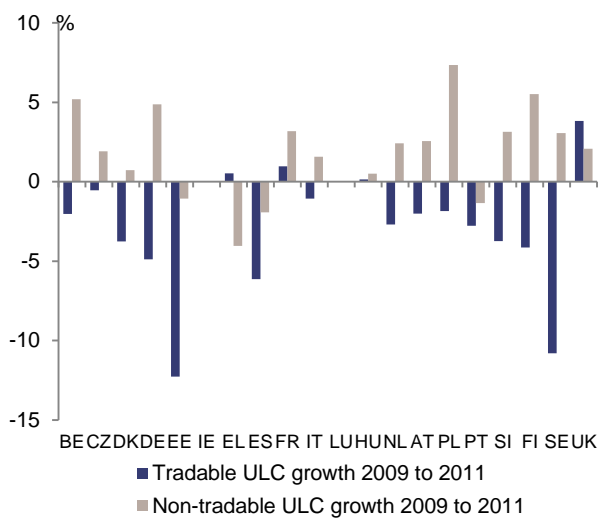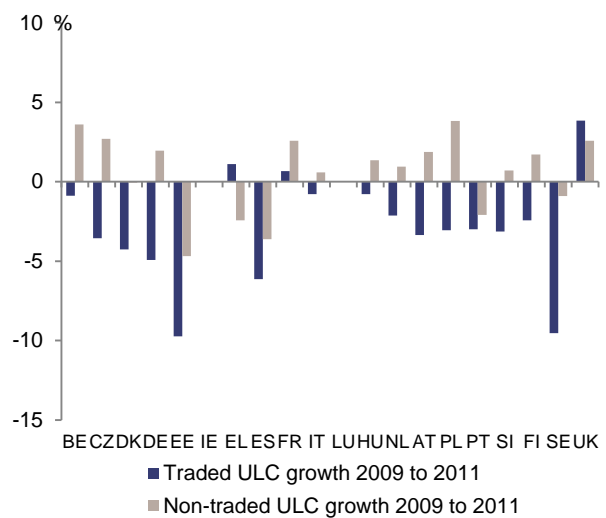
Graph 3: ULC growth rates in (non-)tradable ("traditional" AMECO concept) and (non-) traded sectors (based on value added shares)

2007-11: Tradable
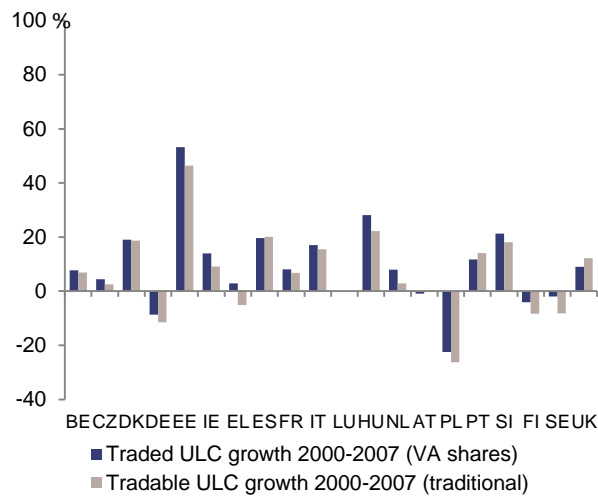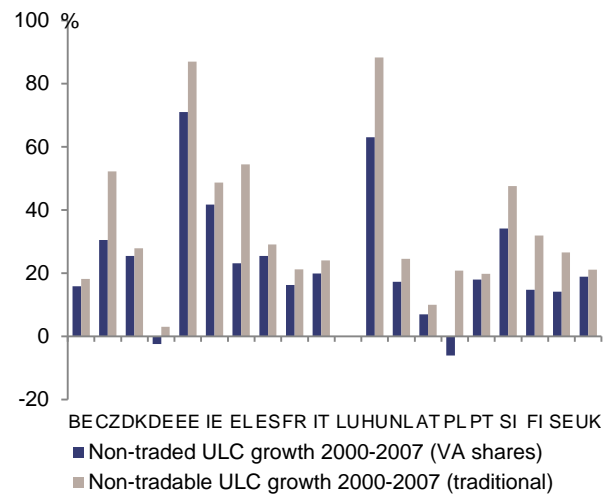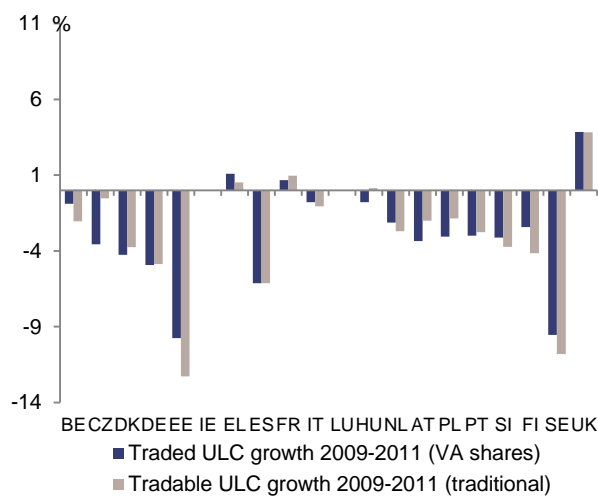

■ Traded ULC growth 2007 to 2011 (VA shares)
■ Tradable ULC growth 2007-2011 (traditional)

2007-11: Non-tradable

■ Non-traded ULC growth 2007-2011 (VA shares)
■ Non-tradable ULC growth 2007-2011 (traditional)

2000-07: Tradable

■ Traded ULC growth 2000-2007 (VA shares)
■ Tradable ULC growth 2000-2007 (traditional)

2000-07: Non-tradable

■ Non-traded ULC growth 2000-2007 (VA shares)
■ Non-tradable ULC growth 2000-2007 (traditional)

2009-11: Tradable

■ Traded ULC growth 2009-2011 (VA shares)
■ Tradable ULC growth 2009-2011 (traditional)

2009-11: Non-tradable

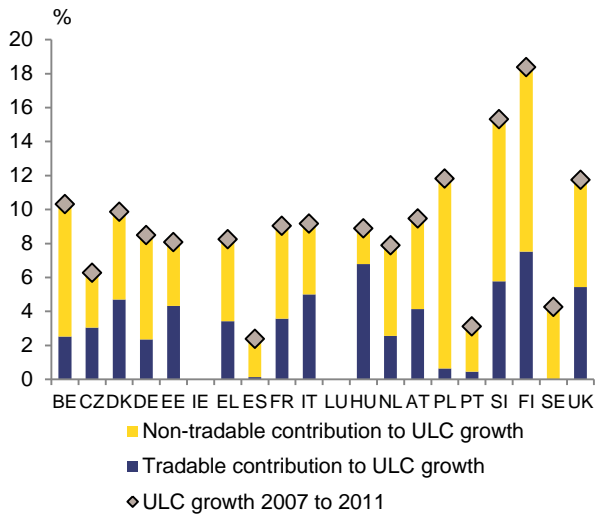■ Non-traded ULC growth 2009-2011 (VA shares)
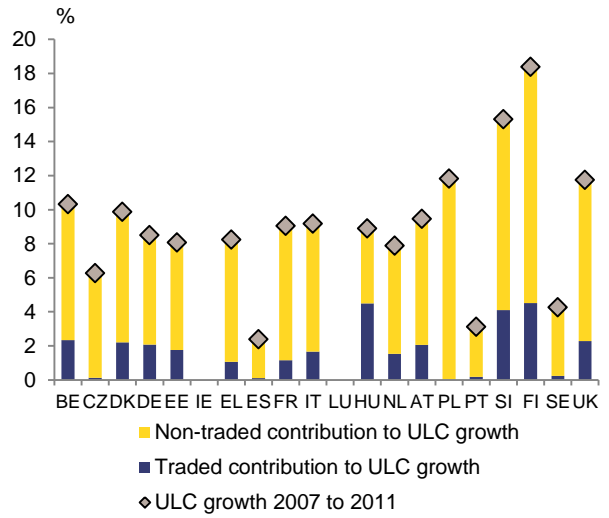■ Non-tradable ULC growth 2009-2011 (traditional)

Graph 4: Contribution to ULC growth rates from tradable and non-tradable sectors, based on value added shares (right panel) vs 'traditional' Ameco concept (left panel)
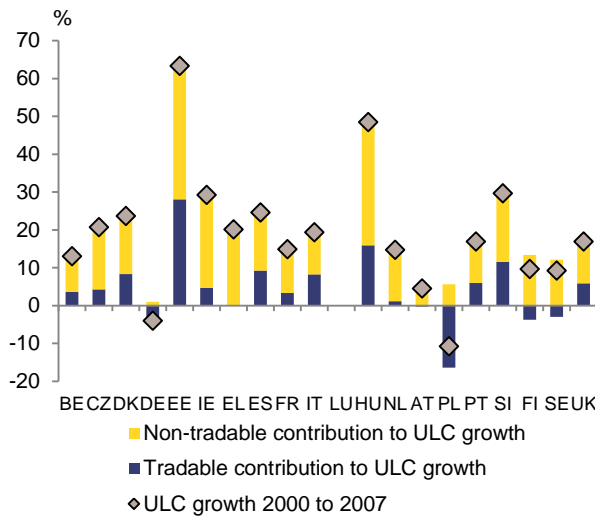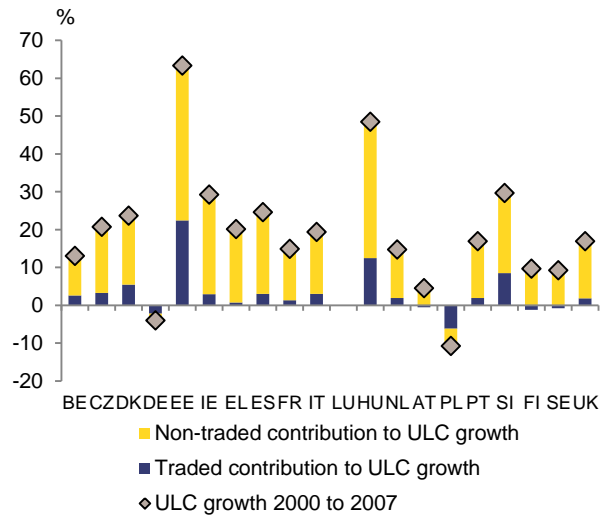
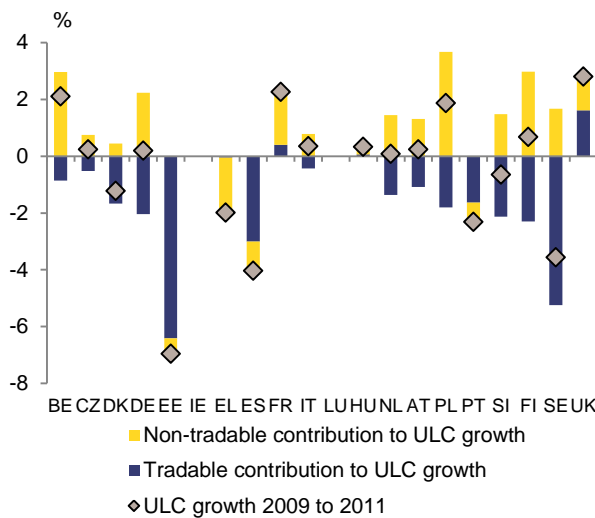### 2007-11: 'traditional' ULC contributions

- ■ Non-tradable contribution to ULC growth
- ■ Tradable contribution to ULC growth
- ◇ ULC growth 2007 to 2011

2007-11: ULC contrib. acc. to VA shares

- ■ Non-traded contribution to ULC growth
- ■ Traded contribution to ULC growth
- ◇ ULC growth 2007 to 2011

2000-07: 'traditional' ULC contributions

- ■ Non-tradable contribution to ULC growth
- ■ Tradable contribution to ULC growth
- ◇ ULC growth 2000 to 2007

2000-07: ULC contrib. acc. to VA shares

- ■ Non-traded contribution to ULC growth
- ■ Traded contribution to ULC growth
- ◇ ULC growth 2000 to 2007

2009-11: 'traditional' ULC contributions

- ■ Non-tradable contribution to ULC growth
- ■ Tradable contribution to ULC growth
- ◇ ULC growth 2009 to 2011

2009-11: ULC contrib. acc. to VA shares

- ■ Non-traded contribution to ULC growth
- ■ Traded contribution to ULC growth
- ◇ ULC growth 2009 to 2011
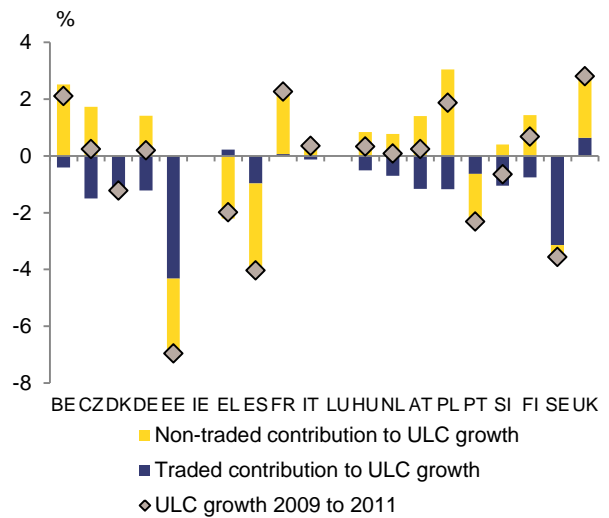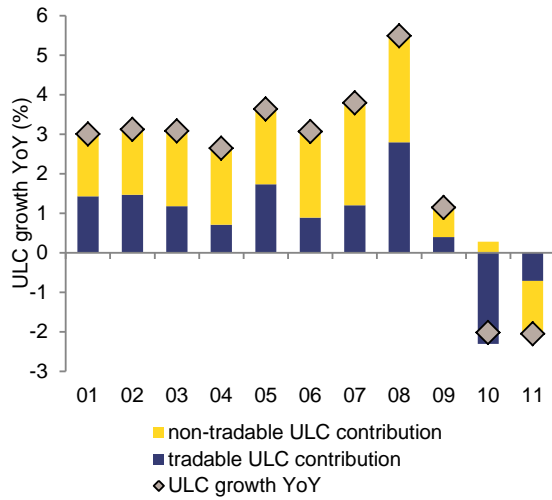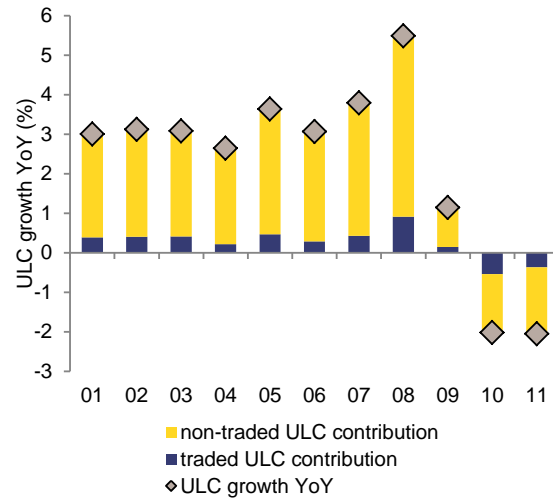
Graph 5: Contribution from tradable and non-tradable sectors to year-on-year ULC growth rates, individual countries

Spain: 'traditional' ULC contributions
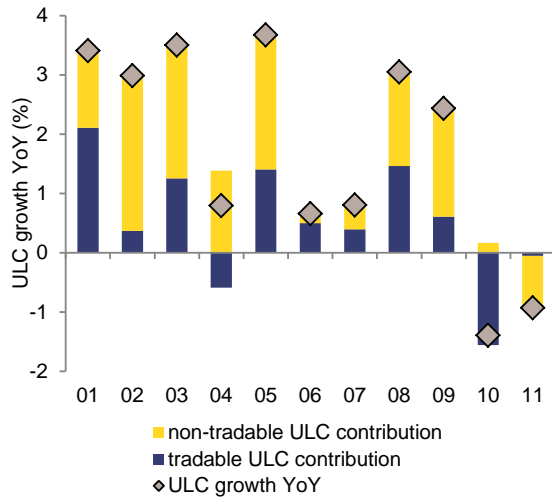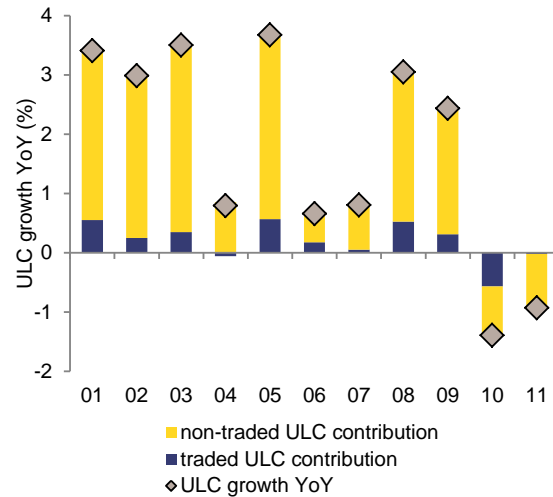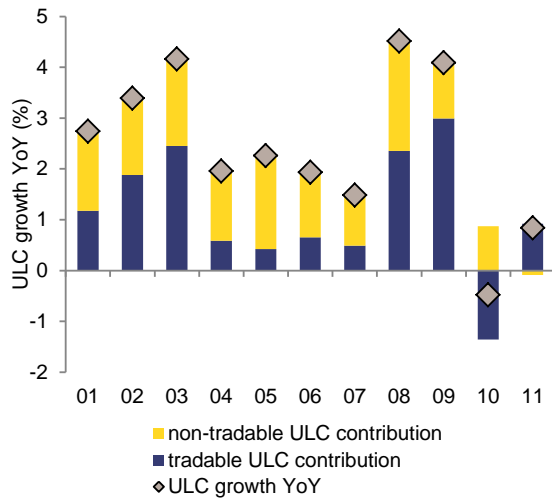

- non-tradable ULC contribution
- tradable ULC contribution
- ULC growth YoY

Spain: ULC contrib. acc. to VA shares

- non-traded ULC contribution
- traded ULC contribution
- ULC growth YoY

Portugal: 'traditional' ULC contributions

- non-tradable ULC contribution
- tradable ULC contribution
- ULC growth YoY

Portugal: ULC contrib. acc. to VA shares

- non-traded ULC contribution
- traded ULC contribution
- ULC growth YoY

Italy: 'traditional' ULC contributions

- non-tradable ULC contribution
- tradable ULC contribution
- ULC growth YoY

Italy: ULC contributions acc. to VA shares

- non-traded ULC contribution
- traded ULC contribution
- ULC growth YoY