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**Georgia's economic specialisation:  
Present and future**

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The German Economic Team Georgia (GET Georgia) advises the Georgian government and other Georgian state authorities such as the National Bank on a wide range of economic policy issues. Our analytical work is presented and discussed during regular meetings with high-level decision makers. GET Georgia is financed by the German Federal Ministry for Economic Affairs and Energy under the TRANSFORM programme and its successor. Our publications are publicly available at our website ([www.get-georgia.de](http://www.get-georgia.de)).

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## **Georgia's economic specialisation: Present and future**

### **Executive Summary**

Georgia's economy is mainly specialised in transport and travel services, agricultural products and some metal and chemical products. Increasing export volumes, also to close the trade and current account deficits, entails specialising in more and new products. This is all the more important as the diversification of exports across products is currently unsatisfactory, with the top ten export products making up two thirds of total exports. Also, the main exports exhibit relatively low value-added intensities. Georgia should therefore increase the range of products it is specialised in and ensure that new specialisations also have higher value-added or serve as stepping stones to specialise in higher value goods in future.

Using an innovative, empirical method we predict that Georgia has potential to specialise in four major areas in future: energy-intensive products, agri-food products, manufacturing and business services. These predictions are made by quantitatively using the experience of other countries. If countries which previously had a similar specialisation profile as Georgia has today are now specialised in some products, Georgia should also have potential for future specialisation in these products.

The four major areas identified here are credible. For example, Georgia has excellent hydro-power potential and is a transit country for energy, which contributes to low energy prices required in the production of energy-intensive goods such as aluminium. Also, conditions for agriculture and food production in Georgia are excellent, yet the country runs an agricultural trade deficit, which indicates unexploited potential for specialisations in more agri-food products.

The information provided in this paper should be used by the government in two major ways. Firstly, it should inform the government's vision of the economic future of the country. Such a vision is necessary for communicating with potential investors and for shaping a long-run debate on the future of the economy, but should be informed by objective analysis as presented here rather than only by subjective views derived from the present situation. Secondly, regardless of whether an explicit industrial policy is pursued or not, the government must occasionally make non-neutral decisions that favour individual sectors, for example in the domain of public infrastructure investments, public education or trade negotiations. To ensure the decisions maximise the value for the country, they should take into account both the objective potential in individual sectors as well as the value-added intensity of the products.

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## **1. Introduction**

Specialising in producing and exporting the goods and services a country has comparative advantages in is a key challenge on the path of economic development. In the past ten years, Georgia's main exports have largely remained the same – transport and travel services, diverse products of the agri-food sector and some metal products. Increasing the size of and the value-added generated by the economy and hence the income level of Georgia depends on recognising and developing new strengths. For this, investors and the government must gain information on where those new strengths may be located: in order to shape their actions, but also in order to conduct a necessary debate on what may be the future of the Georgian economy.

Such a long-run debate on what may be the future specialisations and hence the “economic identity” of Georgia requires objective information that goes beyond pure reasoning from present strengths. Restricting the scope of the debate to current strengths entails the risk of missing opportunities in other areas. Comparative advantages originate in a multitude of aspects, including natural conditions and resources as well as skills and human capital gained in the production of the present basket of goods and services. Identifying potential for new specialisation should therefore not be restricted to the extension of present strengths but should draw on the experience of other countries with similar conditions and starting points. This is what we attempt in this paper.

In the following, we use an empirical method to predict Georgia's potential for economic specialisation in a range of areas of economic production, using a large, international dataset of 180 countries and their specialisation in more than 1,000 goods and services. We first analyse the current export specialisation of Georgia. We then explain our method for predicting future potential and present the results of this prediction before finally turning to policy implications of these results.

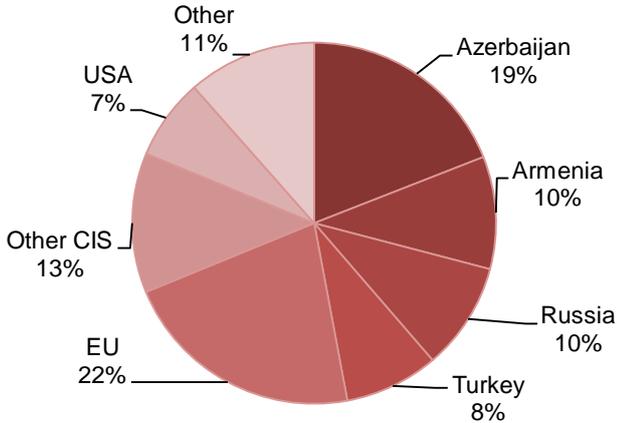
## **2. The current structure of exports**

At present, Georgia is mainly associated with specialisation in the areas of tourism, agri-food (especially wine, water and spirits) and as a transit country for energy and goods. Other than often imagined, however, some products of the mining and industrial sector including ferro alloys, gold and copper ores are also important export goods. Yet, the strengthening of Georgia's exports remains an important task. Exports of goods and services in the order of 45% of GDP in 2014 and imports at 58% of GDP lead to significant trade and current account deficits.

Apart from the necessity to increase the volume of exports, qualitative characteristics of the export structure also deserve attention. Firstly, export destinations and products should be diversified to reduce exposure to shocks stemming from single countries or product markets. Secondly, it is desirable for a country to specialise in products with a relatively high value-added. This generates the revenues that can finance higher incomes and stronger growth. Developing new specialisations should also contribute to these qualitative characteristics.

The structure of destination markets for Georgian exports already exhibits a good degree of diversification (see Figure 1 below). No single trade partner accounts for more than 20% of goods exports. Exports to the CIS make up 52% of total exports, but within this, no disproportionate exposure to any single market exists and exports to Russia make up only 10% of exports, even after the lifting of the Russian ban on imports of wine from Georgia. The Georgian economy’s vulnerability to weaknesses of individual trade partners is thus relatively limited, although an increase in trade with non-CIS partners would overall seem desirable. The recently signed deep and comprehensive free trade agreement with the European Union should contribute to this aim, but expanding trade ties with partners in Asia and overseas also deserves attention.

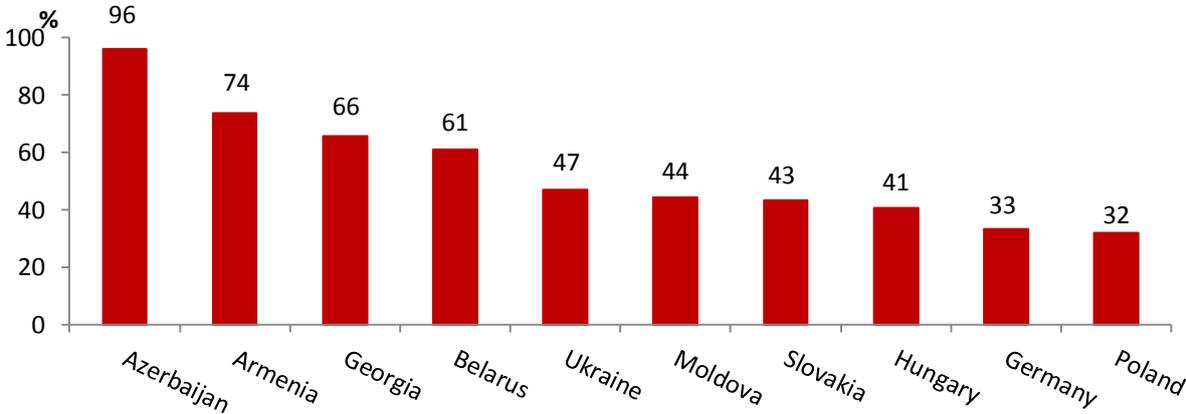
**Figure 1**  
Destinations of Georgian exports (goods), 2014



Source: Geostat

In the product dimension, however, Georgia’s export diversification leaves room for improvement. The ten largest export products make up two thirds of total exports, driven in particular by transport and travel services. While this is less than in Azerbaijan or Armenia, it is more than twice as much as in Germany or Poland.

**Figure 2**  
Share of total exports made up by ten largest export products



Source: UN Comtrade and services trade database, own calculations  
Values for 2009-2011 average, goods and services

Apart from the export of nuts, no major products entered the palette of the Georgian top export products in the last ten years. Of course, this statistic is somewhat affected by the definition of individual product categories in the data. Particularly services categories, of which transport and travel are top exports of Georgia, are broader than goods categories, leading to a greater share of the top ten exports of Georgia. Still, increasing the range of other export products and their volumes will improve export diversification in product space and reduce the vulnerability of the economy to shocks in individual product markets.

Export diversification across destination markets and products is important for reducing dependencies on single markets and hence vulnerability to shocks. But the value of export products also matters. Some product markets are more attractive than others. Homogenous commodities (such as coal or grains) are exported by many countries. As the coal produced by one country is easily replaceable by that produced by another country, fierce competition drives down the margins earned by and hence the value-added created in producing these goods. The competition in the markets for more technology intensive, specialised or customised products on the other hand is less intense and therefore, the value-added in these products is larger.

**Box 1**

The Value Factor

We analyse the value-added intensity of products using the “value factor”. A higher value factor implies that countries specialising in a product on average have higher income levels. The value-added in the production of these goods and services must hence be sufficient to make the products attractive to higher income countries. Specifically, the variable is derived from the correlation coefficient between a specialisation in a product and the income level (GDP/capita) of the specialised countries. The value factor then measures, how much of world exports have a lower GDP correlation than the product in question.

**Table 1**  
Example of products and their value factors

Product	Exports Georgia, 2009-2011, USD m	GDP correlation	Value Factor
Physical and chemical analysis equipment	0.60	1.44	95.1%
Medical/surgical instruments	2.15	0.93	70.0%
Nitrogenous fertilisers	276.42	0.36	42.0%
Travel	2,090.04	-0.26	12.0%

*Source: UN Comtrade and services trade database, own calculations*

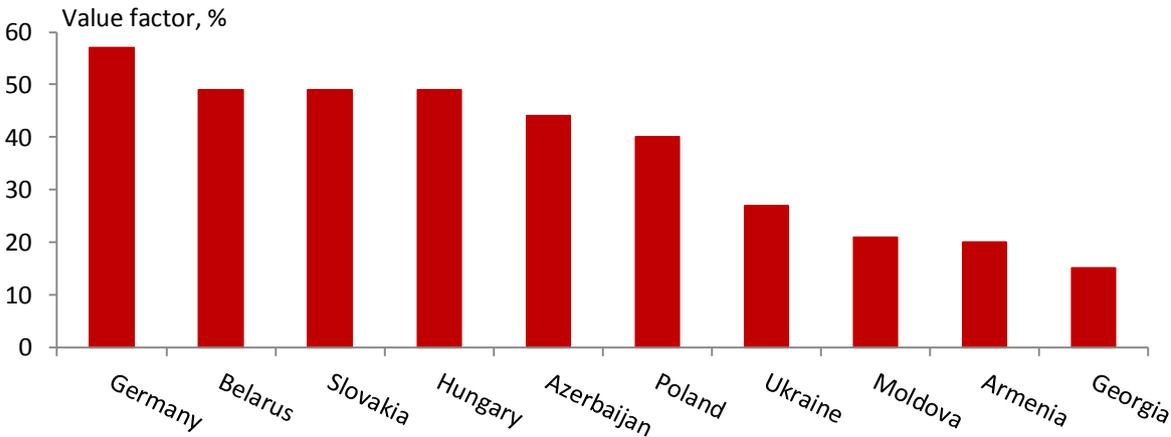
Empirical and theoretical research<sup>1</sup> has also shown a strong correlation between the profile of a country’s specialisations and the speed of its development. Specialisations in the right kind of

<sup>1</sup> See e.g. Hausmann et al. (2007)

products allow stronger economic growth. This does not imply that countries should immediately attempt to produce highly complex, technology intensive products with the highest value factors. Such a strategy has been attempted by several countries in the past and successes have been rare as usually the conditions and prerequisites for producing such goods did not exist. Also, of course not all countries are suited for the production of all goods. Rather, countries should aim to specialise in the right direction: In areas where comparative advantages exist, countries should aim to gradually move up the ladder of value-added intensity – for example trying to move from less to more specialised manufactured products in one industry sub-sector – and not to get stuck in low-productivity commodity markets.

With regard to the value-added intensity of its main exports, Georgia seems to lag behind the neighbouring countries. Among its ten main export products, nitrogenous fertilisers have the highest value factor (42%) whereas travel services exhibit the lowest value factor (12%), as countries with very strong specialisations in tourism are usually countries with lower incomes (although of course examples of high-incomes with strong tourism sectors, such as Switzerland exist – but in these countries, tourism is usually a less important sector than other sectors such as manufacturing and financial services).

**Figure 3**  
Value factor of the ten largest export products, weighted average



Source: UN Comtrade and services trade database, own calculations  
Values for 2009-2011 average, goods and services

**Conclusion 1:** Georgia needs to grow the volume of its exports by developing and expanding specialisations in products where it has comparative advantages. Although the export structure is well diversified in the range of export markets, there is a need to improve the diversification of products and to gradually move towards products with higher value-added.

### 3. Predicting potential specialisation

The export-specialisation of a country is not eternally fixed, but it can evolve over time. Particularly a developing economy will gradually climb up the ladder of value added of the goods it produces, developing from simpler commodities to more specialised products. Vietnam, for example, reduced the share of exports of agricultural goods and raw materials from more than 70% in 1985 to less than 30% in 2010 (Vixathep, 2013). In the same time it developed a comparative advantage, not only in textiles, but also in low-range mechanical manufacturing (e.g., motorcycles)<sup>2</sup>.

Thereby, the goods and services in which a country tends to develop a new comparative advantage are not random. Being better than others in exporting a certain product requires the availability of a certain combination of factors, as diverse as labour cost, legal system, climate or resource availability<sup>3</sup>. This combination differs across products: Textile exports require particularly low labour cost, financial services exports require a strong legal system, banana exports require a warm climate and oil exports require oil resources. More often than not, a combination of two or more factors is essential for being competitive in a certain product. So textile exports are primarily to be found in countries with, both, low transport cost to final markets and low labour cost.

Interestingly, what a country is good at exporting today, gives a good indication of the presence (and absence) of these underlying factors. If a country is currently specialised in exporting textiles, it is probable that this country indeed has comparatively low labour and transport cost (while it might not have other advantages as it would otherwise specialise in higher-value added products than textiles). We measure specialisation in terms of ‘revealed comparative advantage’.

#### Box 2

##### Revealed Comparative Advantage (RCA)

To analyse the economic specialisation of a country, we use “revealed comparative advantage” (RCA), which is commonly used for this purpose. The RCA measures the relative importance of exports of a good or service among the total exports of one country in comparison with the average export share of this good in other countries. A RCA larger than one implies a specialisation of the country in the production of a good, measured through exports of the respective good.

**Table 2**

Example

Product	Exports Georgia 2009-2011, USD m	a) Share in Georgian exports	b) Share in world exports	RCA = a/b
Ferro-alloys	649	7.54%	0.04%	<b>175</b>
Grape wines	125	1.46%	0.05%	<b>29</b>
Rice	0.38	0.004%	0.04%	<b>0.1</b>

*Source: UN Comtrade and services trade database, own calculations*

<sup>2</sup> According to IMF data in constant prices.

<sup>3</sup> Past specialisation in a product, the specialisation in related products and the size of the market for this product also matter, see Huberty and Zachmann (2011).

Consequently, the potential strength of a country in exporting a certain product can be deduced from the countries' current exports. For example, countries currently specialising in 'unwrought aluminium' are more likely to develop a competitive edge in say 'aluminium bars' than in 'semi-conductors'.

In the following, we quantitatively establish regularities of specialisation correspondences and employ these to predict what products Georgia might competitively export in the future.

### 3.1 Our approach

To establish what products Georgia might develop a competitive advantage in given its current specialisation, we proceed in two steps: First, we analyse in which other products countries that currently specialise in a particular product were typically specialised in in the past.<sup>4</sup> We find, for example, that most countries that are now specialised in exporting 'aluminium bars', were in the past specialising in 'unwrought aluminium', 'electrical energy' and 'aluminium plates'.<sup>5</sup> In a second step we use the regularities we have established for each product to predict Georgia's future potential. If, for example, competitive strength in a certain product (C) was found to be contingent on past strength in two other products (A&B), and Georgia currently features a comparative advantage in these two products (A&B), we predict that Georgia might have a potential in developing a comparative advantage in the first product (C). The data used for this analysis is UN COMTRADE and Services Trade data for ca. 1350 varieties goods and 11 kinds of services.

### 3.2 Results for Georgia

We will not present the results for each product Georgia might or might not export, but focus on some interesting findings. The main finding is that Georgia's current strengths will largely persist. In seven of the ten products for which we predict the largest export volume potential (measured in current global market size of the product times the predicted Georgian world market share in this product) Georgia is already specialised today. Our model predicts specialisations in exporting services, nuts, liquors, fertilizers and ferro-alloys.

In addition, we predict significant export potential for Georgia in three other products in which Georgia is currently not specialised: unwrought aluminium, petroleum oils and business services. Despite not being specialised in exporting these products, trade data suggest that Georgia already today features gross-exports in those categories. In fact, none of the three is completely unrealistic. High hydro power potential and ports might indeed permit *aluminium* exports (see 3.1). Some potential for *oil* exports is also given: Georgia was a main oil producer in a distant past (70,000 barrel per day in Soviet times) and geology might potentially allow repeating this history (Roberts, 2013). In addition, re-export of oil from the oil-rich Caspian region is technically feasible (whether it is of value

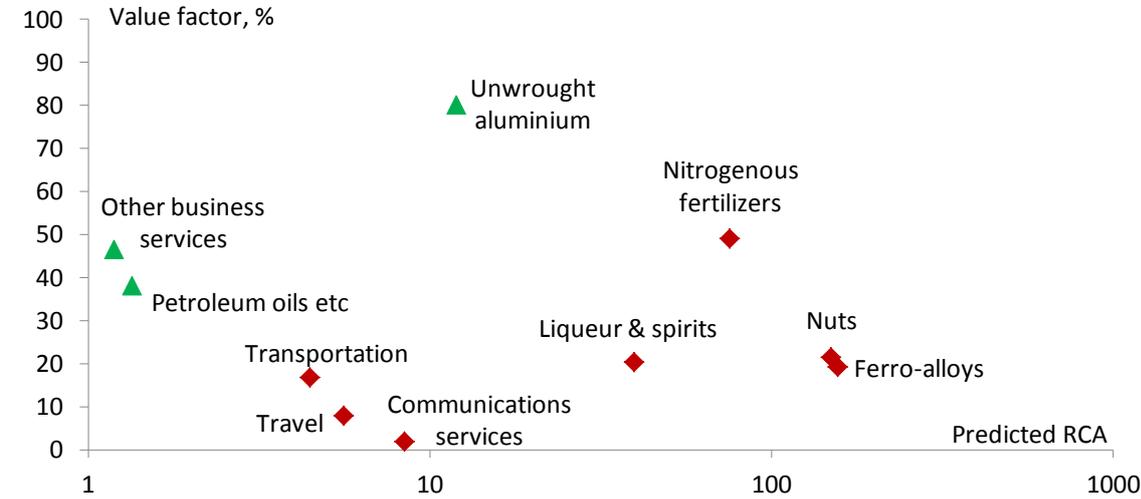
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<sup>4</sup> We use data provided by the UN for an average of 2009-2011 at the HS4 goods classification, distinguishing around 1250 types of goods as well as data on services trade for 11 types of services. As export values by good or service for all world countries are required to calculate the RCAs for each good and service, 2011 was the latest useable year in the dataset. Car exports are not excluded from the data as these were not produced in Georgia, but only constituted a re-export trade with Azerbaijan.

<sup>5</sup> See Table A1 in the Annex for an illustration and technical description.

is another question). Finally, Georgia is already today strong in exporting *business services*. So this sector might be grown further in the future (see 4.4).

**Figure 4**  
Value factor and predicted RCA of 10 largest predicted exports



- ◇ products in which Georgia is already specialised
- △ products in which Georgia has no revealed comparative advantage

Source: UN Comtrade and services trade database, own calculations

In terms of value, most of the predicted top-10 products in which Georgia is already specialised have relatively small value factors. On the other hand, the new predicted products are more likely to be also exported by richer countries. So from a diversification and value perspective, increasing exports of unwrought aluminium, petroleum oils and business services would be good. Beyond the presented top-10, there are also a number of individually smaller, yet in aggregate important, products in which Georgia has currently no comparative advantage, but for which we predict some future potential. Those can be summarised in four sectors: Energy intensive, Agri-food, Manufacturing and Business Services, which we will discuss in detail in part 3.

### 3.3 Caveats

Obviously, such a parsimonious methodology is not able to fully appreciate the conditions in a country – let alone grasp the impact of possible changes in the economic environment. So the provided list of products is neither complete nor definitive. Still, it provides a structured insight which types of goods and services countries with similar export specialisation like Georgia managed to develop.

The described approach is extraordinarily good at making intuitive predictions. For a solely quantitative algorithm based on not always reliable trade data<sup>6</sup> the number of obvious statistical artefacts is very limited. Consequently, we are confident that the results provide a reliable basis for

<sup>6</sup> For example, the exports reported by the exporting country in UN COMTRADE data do not correspond to the imports reported by the importing country.

discussing the potential specialisation of a country. But we also urge to exercise caution in interpreting the results. Our results are deductions, based on a significant number of countries with similar strengths as Georgia's present strengths having managed to develop a comparative advantage in the predicted product several years later.

Our predictions are no guarantee that a certain sector will develop in the future, but indicate a probable potential given the present strengths of Georgia and the past experiences of other countries. If further analysis finds that all necessary, immutable conditions for the development of these specialisations are met in Georgia and the right decisions are made by private and public sectors alike, only then will these specialisations indeed develop in future.

Finally, we emphasise that our analysis is in terms of gross exports. That is, some of the export data might actually not refer to goods produced in the country, but to goods that were re-exported (instead of transited) for one reason or another (e.g., customs or tax regimes)<sup>7</sup>.

**Conclusion 2:** In terms of the Top-10 exports Georgia's current strengths will largely persist. In seven of the predicted Top-10 exports Georgia is already competitive. But we also identify some underexploited potential for diversification and value, for example, in 'unwrought aluminium' and 'business services'.

#### 4. Possible new specialisations

Coming back to the initial issue of diversification and value, the key question is in which new sectors Georgia can develop a comparative advantage. We identify four areas: Energy intensive products, agri-food, manufacturing and business services.

##### 4.1 Energy intensive products

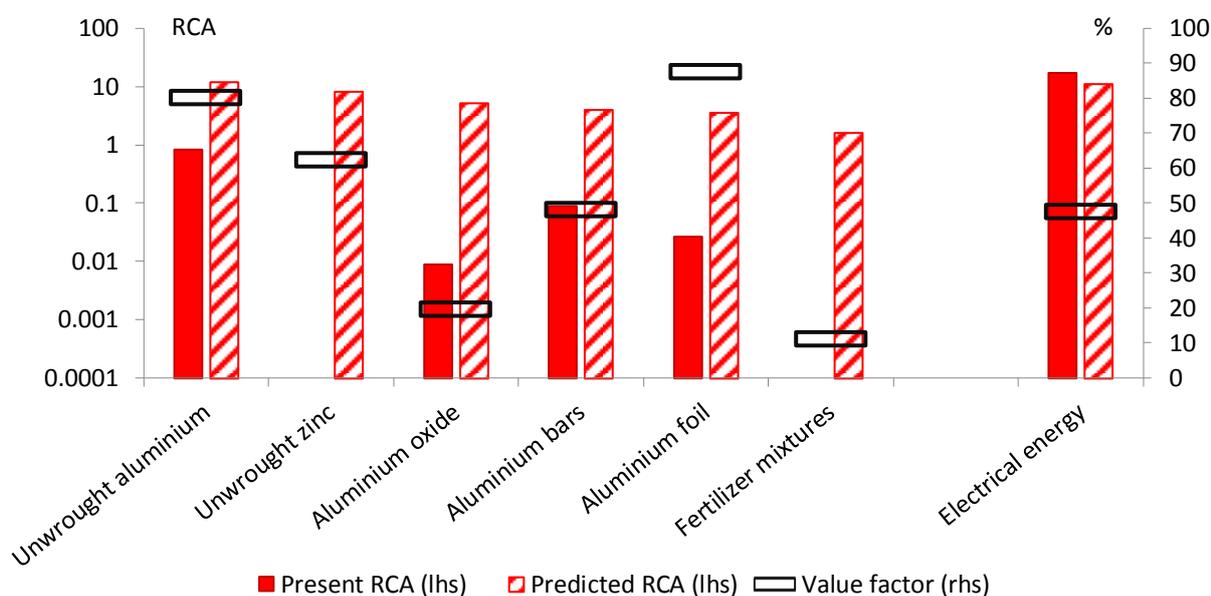
The first area for which we identify a high potential is that of energy intensive products. The six products in Figure 5 below all use energy as a main input in the production process. For all of them our methodology predicts some potential. The intuition behind these results is, that Georgia already today exports, both, energy and energy intensive products. This indicates that those are less costly, than in the countries to which they are exported – so Georgia has a comparative advantage in exporting them. And while Georgia's own oil and gas production is currently limited, its privileged access to Azeri oil and gas might translate into better prices/access than in countries that are further away from corresponding sources. Most importantly, Georgia has significant hydropower resources. The country is almost self-sufficient in terms of electricity and in particular during summer it is a net-exporter. Additional hydro resources are and might be exploited in the future. Finally, Georgia serves as an electricity trading hub in the region – allowing it to import electricity cheaply from where it is abundant and selling it more expensively elsewhere. In addition to providing rather resilient electricity supply, this could also allow big domestic consumers to secure low electricity cost – even at times when Georgia's hydro-potential is fully used (e.g., in winter).

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<sup>7</sup> We do not use the corresponding Comtrade data on 're-export', as they did not appear too consistent between countries.

**Figure 5**

Energy-intensive products; present and predicted RCAs and value factors



Source: UN Comtrade and services trade database, own calculations

However, developing the potential in energy intensive products might require some strategic choices as the capacity to produce low-cost electricity are not unbound. So there might be several important trade-offs here<sup>8</sup>:

- Excessively developing low-cost electricity production (i.e., large scale hydro-power projects) could have an impact on touristic attractiveness
- Electricity exports can compete with low domestic prices
- Many electricity intensive sectors are large-scale integrated industries (such as steel, aluminium or copper) with a very high minimum-size. Consequently, Georgia's electricity generation capacity might be insufficient to host several such sectors.

But according to the government website [www.hydropower.ge](http://www.hydropower.ge) 'less than 25% of an estimated potential 40 billion kWh of economically feasible hydropower has been harnessed in the country.' So the potential for electricity intensive products is real.

#### 4.2 Agri-food products

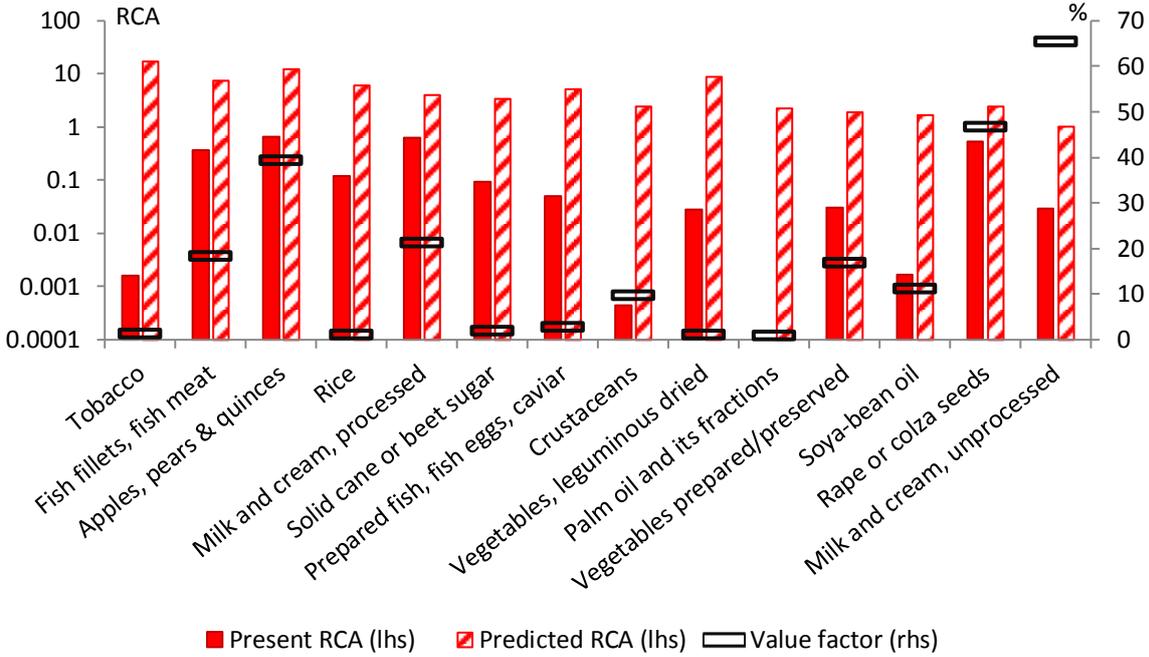
Our analysis finds a number of agricultural produces in which Georgia might have potential to specialise. This is no surprise, as already today Georgia is a strong exporter of agricultural products. But more diversification appears feasible. In fact, in a previous paper, we showed that Georgia should export much more agricultural products, given its huge agricultural workforce and good natural conditions<sup>9</sup>. Low export volumes are due to low productivity and lack of access to new

<sup>8</sup> We plan to analyse the development potential in electricity intensive products and the electricity industry in an upcoming policy paper.

<sup>9</sup> See the publication of GET Georgia, Policy Paper PP/02/2014 "Georgia's agricultural exports".

markets (especially, the EU market). In fact, the DCFTA with the EU is an important precondition for market access. Now, the challenge is mainly to Georgian producers to comply with EU standards. Here, some public support in establishing the necessary quality-infrastructure might be crucial in enabling exports. Anecdotal evidence from other countries such as Ukraine show, that exports of individual products already picked up as soon as market access was established.

**Figure 6**  
Agri-food; present and predicted RCAs and value factors



Source: UN Comtrade and services trade database, own calculations

In terms of value, agri-food products are very mixed. So blindly trying to increase agricultural exports at all cost is certainly no good economic development strategy. But in certain niches – such as milk or apples – a potential comparative advantage of Georgia meets an above-average value factor.<sup>10</sup>

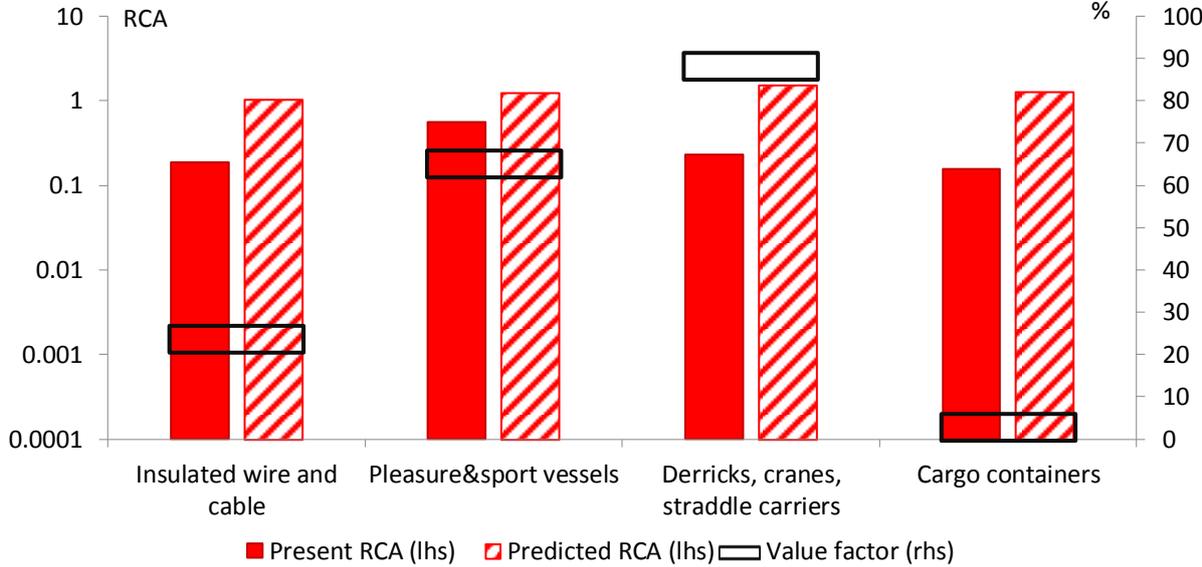
4.3 Manufacturing

In public perception, Georgia’s economy is currently not associated with exporting manufactured products (e.g. of the engineering sector). However, in past, Georgia featured several strengths in this area. Not all of them were natural – some were in fact imposed by inner-Soviet work-sharing – but several sectors (e.g., locomotives) managed to survive. Completely ignoring manufacturing and focusing economic policy solely on agriculture and the service sector might be a risky choice. Exporting tradable manufacturing products is, both, good in terms of diversification and value. A specialisation in manufacturing forces a country to not only to live on good natural conditions (such as low energy prices and good climate) but also to improve in terms of infrastructure, education,

<sup>10</sup> This needs to be considered with great care. Some agricultural exports of rich countries might not indicate that those are comparative advantages of these countries, but that there are (export-) subsidies at play.

legal system and public administration. So improving a country’s potential in manufacturing often boosts its overall competitiveness.

**Figure 7**  
 Manufacturing; present and predicted RCAs and value factors



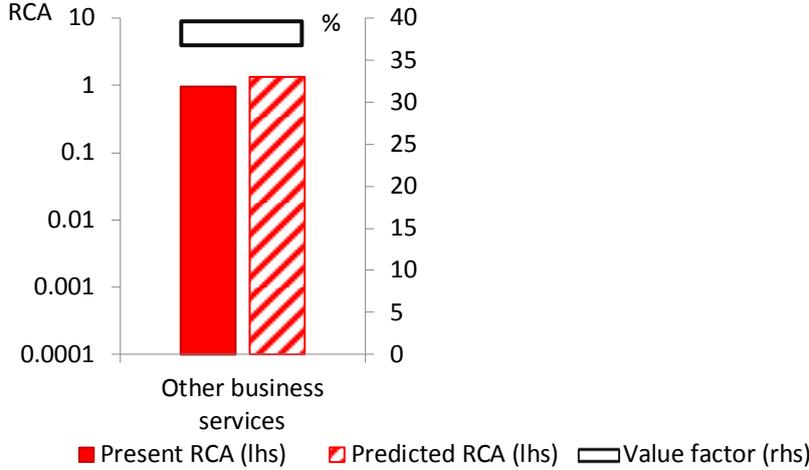
Source: UN Comtrade and services trade database, own calculations

Comparatively lower value manufacturing products (such as containers, wire and cables) can serve as a stepping stone to higher value added exports, for example, by making the country know as a reliable place for outsourcing. For example, several success stories of car manufacturing in Central and Eastern Europe started with the production of simpler outsourced components, such as cable trees, for Western European car manufacturers. The feedback received from the investors can also be valuable information for the public administration to identify the most important barriers to further growth and lower value manufacturing exports can hence pave the way for more complex and higher-value exports.

4.4 Business services

The category of “other business services” encompasses services such as market research, legal services and accounting as well as operational leasing services (for example of agricultural equipment such as tractors).

**Figure 8**  
 Business Services; present and predicted RCA and value factor



Source: UN Comtrade and services trade database, own calculations

The attractiveness of the services sector to many developing countries stems from the relatively low investment volumes and physical capital required to generate jobs. However, to specialise in these services, good education as well as language skills are of great importance as well as competitive wages and a well-functioning telecommunications infrastructure. Although foreign language competence is already fairly well developed among academically educated Georgians, to fully exploit this potential the government would be well advised to seek the dialogue with the private sector to improve the quality of education in general, identify gaps in curricula and shortages of individual qualifications.

**Conclusion 3:** Georgia has potential to develop a new comparative advantage in a number of energy-intensive, agri-food and manufacturing products and might also specialise in exporting business services. In some of the areas we identify apparent barriers that hold back current specialisation. Policy might play an important role in resolving them, by for example, ensuring competitive electricity prices or supporting access to the EU agriculture market.

## 5. Policy implications

The development of economic specialisations should ultimately be the outcome of market processes, not government planning. Yet there is still a role the public sector should and indeed must play, both by participating in a long-run debate on the “economic identity” of the country and by making necessary decisions that, intended or not, will shape the profile of economic development the country will embark on and hence the development of economic specialisations.

Particularly for the communication with potential investors, the government and its relevant agencies such as Invest in Georgia should have a clearly formulated vision of the economic potential of the country. Good performance in indicators such as the Ease of Doing Business indices is clearly very important, but investors often want to hear that the government also sees potential in their fields to be reassured that they will find good conditions for making their investments. Also, an objectively guided view on in which sectors potential exists can help structuring investment attraction activities and may even lead entirely new investors to consider Georgia as a possible country to invest in. An assessment of sector potential from neutral, objective analysis as presented here will both underscore the government’s arguments and ensure that no new sectors are forgotten and incumbent strengths (in which the potential may already be exhausted) are overstressed.

Through its decisions and policies, the government sector also directly influences the process of economic development. This may be done through an explicit industrial policy, with which a government can directly attempt to foster the development of either specific or all new sectors. Whether or not governments should run explicit industrial policies is a large debate and whether the Georgian government should do so or attempt to be as neutral as possible to all economic sectors is therefore outside the scope of this paper.

However, there are also necessary decisions in which a government cannot avoid being non-neutral to economic sectors. This particularly concerns decisions on the allocation of scarce public resources. Public infrastructure investments such as highways will not favour all sectors equally – they may either connect, for example, the beach or an industrial park to the airport. Education systems can be strengthened to provide more engineers or lawyers to the economy. And even in trade negotiations, a government’s bargaining power is not unlimited – one can often not get perfect market access for all possible products but has to concentrate on negotiating market access for some products that the country has comparative advantages in and which may be successfully exported.

Such decisions should be grounded in objective analysis, starting, but not ending with the information presented in this paper. They should take note of the objective potential the country has for specialisation in sectors, enriched with information by market actors. GET Georgia will also aim to provide deeper, qualitatively and quantitatively founded insights into the potential in the areas highlighted here in a forthcoming publication. As particularly in a relatively small country such as Georgia the economy will not be able to specialise in an unlimited number of products, areas of possible specialisation should also be compared by the value they bring to the development of the country. The value-added intensity of products varies and, where choices are to be taken, products with higher value factors or which are good stepping stones on the way to higher value products should be favoured.

## Annex

**Table A1**

Products whose competitive advantage in 2001 explains a competitive advantage in 'aluminium bars' in 2009-2011

<i>Product Name</i>	<i>Coefficient</i>
Electrical energy	0.39
Unwrought aluminium	0.38
Aluminium plates, sheets and strip, thickness > 0.2 m	2.06
Parts for use with lifting, moving machinery	0.08
Oils petroleum, bituminous, distillates	0.11
Copper wire	-0.15
Copper pipes, tubes	-0.22
Prepared unrecorded sound recording media	-0.10
Industrial food and drink preparation machinery	-1.23

*Source: UN Comtrade, UN service trade database, own calculations*

In technical terms, we run a Lasso regression of the 2000-2003 RCA of all countries in a certain product (y) on the 2009-2012 RCA of these countries in all other products (X). The algorithm forces most coefficients to become zero and only selects a small set of relevant explanatory products, thereby resolving the issue of collinearity. The regression was run on all products and services in 2001. It identified which linear combination of products is best suited for predicting a competitive advantage in 2009-2011. In the table we excluded four products with small (still significant)  $\beta$  values. Negative values indicate, that a specialisation in the corresponding product in 2001 coincides with the absence of 'aluminium bars' exports in 2009-2011.

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