Introduction.

Economic complexity theory deepens our understanding of export diversification. However, it relies on aggregated data which might disguise important details. In particular, these data do not take information on importers into account. However, this information can provide new insights about the pace of economic complexity evolution in a particular economy. We introduce these new insights by incorporating more detailed export data into analysis. We find that wealthier economies not only tend to export more sophisticated products, but also sell them to richer destinations. We discuss the case of Russia which aims to become a more complex economy and gain technological sovereignty by implementing reindustrialization policy. However, Russian complex products rarely conquer richer markets and are better known to its geographic neighbors. Our findings suggest that such a pattern of reindustrialization might not be promising as long as a higher level of wealth is a concern. We claim that redesigning industrial policy such that it becomes more conditioned on export outcomes is not a solution to the problem, but is one of its important ingredients.

The surge in economic complexity literature (see Hidalgo, 2021) delivered a powerful analytical toolkit and structured argumentation (Hidalgo, Hausmann, 2009, Hausmann et al., 2014) which are used to study a variety of mechanisms linking the ability of a particular economy to produce complex products with an extensive list of phenomena and processes, such as income inequality (Hartmann et al., 2017, Zhu, Yu, He, 2020, Sbardella, Pugliese, Pietronero, 2017, Bandeira Morais, Swart, Jordaan, 2018, Fawaz, Rahnama-Moghadamm, 2019), human development (Ferraz, et al. 2018, Lapatinas, 2016, Neagu, 2019) or greenhouse gas emission (Neagu, Teodoru, 2019, Can, Gozgor, 2017, Lapatinas, et al., 2019, Romero, Gramkow, 2021), to mention a few.

Economic complexity theory applies dimensionality reduction techniques to data on geography of economic activities, which helps making inferences on the location of economic output, such as export or employment. There is, however, at least one serious concern about the approach which lies at the core of the theory. The approach routinely relies on data, which inform about the location and the type of economic output, but not about its recipients. As we argue below, these data might enrich the discussion of structural transformation (Mc Millan et al, 2016) and help construct a more sophisticated approach to estimate the level of economic complexity.

The concept.

To characterize changes which result from a shift in the production structure of a particular economy, Hausmann, Hwang and Rodrik (2007), or HHR, introduced EXPY, a metrics of export sophistication. The metrics was designed to generate a signal whenever a country was becoming an exporter of a new product.

EXPY is introduced in two steps. At the first step, the value of exporting product p by economy c, which is denoted as x_{cp}, X_c connotating the total exports of country c, and Y_c, the level of GDP per capita, help construct the following indicator:

$$PRODY_p = \sum_c \frac{\left(\frac{x_{cp}}{X_c}\right)}{\sum_c \left(\frac{x_{cp}}{X_c}\right)} Y_c \quad (1)$$

$PRODY_p$ provides a characteristic of product p, indicating whether richer or poorer economies, i.e. producing a larger or a smaller Y_c, are its main manufacturers. $\frac{\left(\frac{x_{cp}}{X_c}\right)}{\sum_c\left(\frac{x_{cp}}{X_c}\right)}$ is the index of revealed comparative advantage (see Balassa, 1965), which is used here as a weight assigned to Y_c. $PRODY_p$ suggests, that a more sophisticated products are typically exported by richer countries.

Since $PRODY_p$ is calculated for each p, one can derive an economy-wide characteristic $EXPY_c$, which is a weighted sum of all the relevant $PRODY_p$ values, each serving to characterize a product from economy c's export basket:

$$EXPY_c = \sum_p \left(\frac{x_{cp}}{X_c}\right) PRODY_p \quad (2)$$

As is argued in HHR, a higher $EXPY_c$ is associated with faster economic growth. This might be because a successful transition to a higher level of product sophistication opens a door to a small club of complex products' manufacturers belonging to the global technological vanguard. They might reap higher benefits resulting from a lower level of competition at the global market for a specific product.

However, $EXPY_c$ might not be an informative enough measure of product sophistication. It can't distinguish between two different exporters in case they manufacture the same type of product. For instance, an automobile can be equipped with a wide arsenal of sophisticated technologies providing safer, more comfortable and greener driving, while another car can have none of that. Notwithstanding the difference between the two cars, it is not reflected in the export data which routinely classify both cars as automobiles.

However, as long as we agree that the difference between the aforementioned vehicles matters for automobilists, it should also affect manufacturers. A less financially constrained consumer would likely prefer a costlier, yet more advanced automobile as far as she is concerned about safety, comfort and cleaner air. Her preferences will probably be mirrored in the decisions of national bureaucracy, which might introduce barriers to eliminate less safe and environmentally unfriendly products from the national market.

It thus might be challenging to export a less sophisticated automobile to richer destinations. Therefore, joining the global club of cars' producers might not imply an exporting triumph. Instead, a newborn manufacturer can export its products to a small group of neighboring developing economies where consumers are less picky because their financial constrains are tighter. This might limit the opportunity of the manufacturer to reap higher benefits from scale economies.

Therefore, the geography of exports might contain important information about the level of product sophistication. A more technologically sophisticated producer might be able to export its goods to richer destinations than a less advanced one. The problem of $PRODY_p$ is that it fails to distinguish between the two. This might result in recurrent overestimation of growth prospects of less advanced producers.

To avoid this flaw, we disintegrate $PRODY_p$ into its geographic components. We follow Lyubimov and Iakubovskii (2020) and introduce an additional criterion while estimating whether an economy is or is not a competitive manufacturer of a particular product. Unlike the revealed

comparative advantage approach (see Hausmann et al., 2014) which produces a marking of intensively exported products, we examine if an exported good is competitive enough at a specific geographic location. We then calculate a version of *PRODY* using another definition of revealed comparative advantage, which takes exporters, products and importers into consideration. This approach enables us to calculate a two-dimensional *PRODY*, which measures the average level of sophistication of a particular product imported to a specific geographic location.

In case a manufacturer exports its products to locations where an average competitor came from a poorer economy, and fails to compete with provisioners from richer places, we suggest that this might be an indication of a lower level of product sophistication. We then calculate *EXPY* to see how firm its association with per capita GDP is. We discuss the economy of Russia to illustrate our findings.