PROPOSAL ABSTRACT:

Name of Principal Investigator:	María Francisca Pérez Veyl
Proposal Title:	Why outsource when you can automate? Industrial robotics and the impact on global value chains

Describe the main issues to be addressed: goals, methodology and expected results. **The maximum length for this section is 1 page** (Must use letter size, Verdana size 10 or similar).

The rising prominence of robotics and the digital revolution more broadly is increasingly attracting attention of policy makers and researchers because of its potentially devastating effects on the labor markets. Frey and Osborne (2017) and subsequent studies claim that as a result of recent technological developments, 47% of jobs in the US, 57% of jobs across the OECD, and 77% of jobs in China are susceptible to automation.[1] As for the types of jobs with a higher risk of automation, these are blue-collar and routine occupations, while groups of employees more at risk of losing their job or of a wage decline are low-skilled males.[2]

The majority of this literature has focused on the impact on employment outcomes in developed economies. But the potential effects of industrial robotics go well beyond. In this project I argue that robotics will not only impact high robot-adopter countries, but also countries that are lagging behind in terms of new technology adoption. The primary working hypothesis is that increased robot use in high-income countries, with higher relative wages, has the potential to replace jobs in sectors more susceptible to automation that were previously offshored to developing economies, reducing the advantages of production in these low-labor-cost countries. This process could give rise to a 'reshoring' process in which countries with high endowments of robotic capital would start to rebuild multiple productive segments that they had previously offshored, changing the structure of global value chains (GVCs)[3] as they increase their share in the generation of value, while reducing the role developing economies had until recent (Osborne and Holmes, 2016; Unctad, 2016). Studies that investigate specific role of automation and industrial robotics on reshoring patterns and the changing structure of GVCs are limited, and the results are rather preliminary.[4]

The main goal of the research project is to fill in the gap in the literature and investigate quantitatively how robotization impacts trade patterns, and the location and organization of GVCs. To test the working hypothesis of this research, I estimate a reduced form trade model for more than 100 countries over the period 2000-2014, using country-industry panel data on trade and robot adoption from the International Federation of Robotics (IFR), including industry-country-pair, import-country-year and export-country-year fixed effects.[5] To trace the flow of goods and services across industries and countries, and identify the interconnection of countries within GVCs, I use series of world input-output tables from the 2016 release World Input-Output Database (WIOD). In the process, I will also identify which industries are most susceptible to automation, and assess how does automation impact countries' output. Various forms of endogeneity may affect the relationship between automation and trade. To overcome this challenge, I use sector-specific exposure to automation following Frey and Osborne (2017) interacted with robotization at the country level as an instrument for robot adoption.

If the robot-based explanation for changing trade patterns structure is correct then I would expect to obtain the following results: i) imports in industries more exposed to automation because of robot adoption in the importer's country would experience a decrease. This effect should be more pronounced if the importer is a high-income country; ii) imports in industries more exposed to automation in the exporter's country would experience an increase; iii) imports within a GVC from a first exporter country E that previously imported intermediate inputs from a third exporter country C in industries more exposed to automation would experience a decrease. The fact that these imports belong to a GVC is what determines that automation in a third country has a decisive impact.

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[1] Most of these studies stem from an assessment by experts of the risk of automation for a subset of occupational titles, based on the tasks these occupations involved.
[2] See Frey and Osborne (2017), Graetz and Michaels (2018), and Acemoglu and Restrepo (2018b).
[3] A value chain can be simply defined as the "full range of activities that firms and workers do to bring a product from its conception to its end use and beyond" (Gereffi and Fernandez-Stark, 2011). Basically, economies participate in GVCs by importing foreign inputs to produce the goods and services they export ("backward GCV participation") and also by exporting domestically produced inputs to partners in charge of downstream production stages ("forward GVC participation").
[4] See Dachs et al. (2017), Pacini and Sartorio (2017), and De Backer et al. (2018).
[5] This same dataset from the IFR was used by Acemoglu and Restrepo (2018b) and in the pioneering study by Graetz and Michaels (2018). The IFR defines an industrial robot as "an automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which can be either fixed in place or mobile for use in industrial automation applications".