DISTRIBUTIONAL EFFECTS OF IMPORT PENETRATION

AN APPLICATION TO THE SPANISH CASE

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TABLE OF CONTENTS

I. INTRODUCTION

During the last decades the world has experienced a significant increase in economic freedom and globalization, which in turn has contributed to the rise of international trade. It is a fact that international openness provides huge gains to countries. The negative effects of trade are also undeniable: imports could be partially responsible of the increasing wage gap between high and low-skilled workers, leading thus to a rise in the income inequality within countries.

The import penetration effects on wage and employment have been widely addressed in the literature. From the seminal paper by Bernard et al. (2006), several studies have found that wages and employment in advanced economies are strongly correlated with import competition from low-income countries. However, there is still little consensus about how trade openness (import penetration) affects income distribution. This study pretends to analyze the Spanish case and shed some light.

Following recent studies such as Campbell and Lusher (2016), we focus on the impact of import penetration and the consequent distributional effects on Spanish household's welfare. For this purpose, we use the data from the *Encuesta de Condiciones de Vida* (ECV, Household Life Conditions Survey) carried out by the *Instituto Nacional de Estadística (INE)* to measure changes in welfare. Data for imports come from the trade statistics reported by the *Agencia Tributaria* (Spanish Tax Agency).

The remainder of this study is structured in four sections: in Section II we examine the empirical evidence of studies concerning the impact of trade on income distribution. Section III presents data collection and introduces our methodological approach. In Section IV we estimate the effects of imports on the distribution of household's disposable income and purchase power, as well as on other measures of the risk of poverty, economic dependency and social exclusion, in a regional basis in order to analyze the incidence of these impacts. Finally, in Section V we present our conclusions.

II. LITERATURE REVIEW

The Heckscher-Ohlin model provides the main theoretical approach in the subject. According to the Stolper-Samuelson theorem, international trade should lead to an increase in relative wages for the skill-abundant North and a decrease in the unskilled workers in South. This means that while income distribution would improve for developing countries, it would worsen in developed economies. The empirical evidence has showed that it is not true. Some studies such as Meschi and Vivarelli (2009) confirm the causality between trade and increases in the skill premium in developing countries.

Bernard et al. (2006) use plant-level data to study the different responses of US firms to international competition exposure. One of the aims of the research is to observe whether changes across industries reinforce US comparative advantages, so the authors distinguish between imports from low-income and high-income countries, pioneering this empirical. Using plant death and employment growth (for the surviving plants) as dependent variables, it is found that plants in industries with higher exposure to imports are less likely to survive. This result is more than three times higher for imports originated in low-income countries. The same outcome is achieved for the employment growth of the surviving plants.

More recent studies such as Harrison and McMillan (2011) or Autor et al. (2013), among others, deep the US case but focusing in the aggregate labor market outcomes. For instance, Ebenstein et al. (2012) use worker-level data to analyze the effects of import penetration and offshoring on US wages within the manufacturing sector and across sectors and occupations. Their results show that, considering all sectors, workers on occupations more exposed to import penetration face slower wage growth. However, examining the impact within the manufacturing sector no significant effects were found.

The same results are achieved by Autor et al. (2013) using US labor-market data instead of industry-level data. They measure the change in Chinese import exposure per worker in each region. Import exposure in other high-income

countries is included as an instrument to control for the potential correlation of both US employment and imports to unobserved demand shocks. According to this, an increase in the exposure to import penetration leads to lower employment but barely affects wages in the manufacturing sector, which suggests rigid wage setting or compositional changes. In fact, Autor et al. (2014) demonstrate that high-income workers are better able to move across sectors avoiding import exposure and earnings reduction, whereas low-income workers are more likely to remain in the same sector with detrimental effects on wage.

In most cases, offshoring forces reallocation of workers from high wage manufacturing jobs into other industries and occupations with lower wages. In fact some recent studies, such as Ebenstein et al. (2014), reveal that performing an occupational analysis is more effective than an industry-based one, and find a negative impact of offshoring and import penetration on US workers. In their study, the authors provide evidence of less wage impact if worker reallocations take place within the manufacturing sector. Nonetheless, workers leaving manufacturing as a cause of the offshoring-driven unemployment experience larger wage losses.

Several papers offer a new perspective focusing on firm-level data instead of analyzing industries as an aggregate. For instance, Iacovone et al. (2013) find that Chinese imports have caused a considerable sales reduction in smaller Mexican plants. Besides examining Belgian firms, Mion and Zhu (2013) find that import competition from China has a negative effect on employment. Similar results are found for other European countries; Biscourp and Kramarz (2007) for France, Onaran (2008) for Austria, Federico (2012) for Italy, just to mention some cases. Leaving aside the fact that these broad areas imply very different labor markets, a common result in most of them is that higher import penetration originated in low-income countries tends to affect negatively manufacturing employment in the domestic country.

Ashournia et al. (2014) focus on wage inequality among workers. They match Danish firm and worker-level microdata allowing to examine the impact of import competition from China on both firm revenues and wages. In order to measure the import penetration they use a ratio of value of goods imported from China over

total imports plus domestic sales. Two versions of this indicator are used: one including intermediate goods and another one including only final goods as a robustness check. From their results we can extract some interesting conclusions. Mainly, the authors find that Chinese imports increase the wage gap between high and low-skilled workers. In addition, the degree in which domestic firms are exposed to import penetration differs among them depending on their characteristics. Thus, domestic sales are affected by import competition. But the main contribution is to demonstrate that import competition affects in different ways and thus in the aggregate level it is not observable.

Despite the vast literature measuring the impact of import competition on wages and employment, we have not found any work focused on the overall effects on the income distribution. That is why we aim to examine the distributional effects in the 17 Spanish regions, named *Comunidades Autónomas*[1], during a period of nine years (from 2008 to 2016).

III. DATA AND METHODOLOGY

1. Measuring inequality

One of the most commonly used measures of inequality is the Gini index, which can be computed for gross or net income (including taxes and transfers or not), or expenditure. The Gini index measures the inequality in the income distribution, taking value 0 for perfect equality and 1 for perfect inequality. Nonetheless, its main disadvantage is that it gives no information about where the inequality is taking place across the distribution. Additionally, this measure has poor data availability and lower comparability of the indexes between countries and over time. The Standardized Income Distribution Database (SIDD) by Babones and Alvarez-Rivadulla (2007) and the Standardized World Income Inequality Database (SWIID) by Solt (2008) aim to solve these problems.

[1] The *Comunidades Autónomas* are the Spanish first-level political and administrative divisions, corresponding to the European territorial standard NUTS 2.

Among the best alternatives are the inter-decile ratios and the Palma index. Inter-decile ratios compare disposable income among population dividing it into income deciles. The most frequently used are the highest-lowest decile, the highest-median decile and the lowest-median decile ratios. On the other hand, the Palma index, developed by Cobham and Sumner (2013), measures the share of income of the richest 10% with respect to the poorest 40%. As Palma (2011) points out, these two regions are where the inequality actually takes place. This measure is more sensitive to data in the tails than the Gini.

Besides these ratios, we find inequality databases that provide disaggregated microdata to construct distributional indicators. The most important ones are the Luxembourg Income Study, based on household income surveys, and the World Income Inequality Database by the UNU-WIDER. The second is an extension of the Deininger and Squire (1996) dataset.

Particularly, in the case of Spain the unavailability of regional Gini indexes, makes difficult to use this measure. For our study we create our own inequality indicators using data from the *Encuesta de Condiciones de Vida* (ECV), a population survey carried out annually by the *Instituto Nacional de Estadística* (Spanish Statistics Bureau) that provides cross-sectional and temporal information about income, poverty and social exclusion in Spain. As an harmonized statistic[2], it allows the comparability with other EU countries. The subjects were surveyed during four consecutive years, which allows to track the evolution of the variables over time. Specifically, the ECV provides very detailed data about the income distribution, employment, poverty, social protection, housing and other socioeconomic indicators.

Among the available data from the ECV we use the percentage of population per income decile. In order to classify the population, the household disposable income is taken into account.

[2] Harmonization by *Regulation (EC) No 1177/2003* of the European Parliament and of the Council of 16 June 2003 concerning Community statistics on income and living conditions.

The disposable income includes:

- Earned income (salaries and self-employment earnings).
- Investment and property income.
- Transfers.
- Monetary social benefits (including private pensions schemes).

The following items are excluded:

- Social benefits payed in kind.
- Imputed rents.
- Incomes in kind.
- Self-consumption.
- Wealth tax.

Incomes per consumption unit are obtained dividing the household total disposable income according to the modified OCDE scale, that is assigning a weight of 1 to the first adult, 0.5 to the other adults and 0.3 to the children under the age of 14. The income data is referred to the year before the survey is conducted.

In order to construct our distributional indicator, we use the income distribution according to the population division in income deciles and then defining the deciles ratios. For simplicity, we assemble the deciles in three blocks: (*A*) high, (*B*) medium and (*C*) low income groups.

$$A = D_{10} + D_9 + D_8 \qquad B = D_6 + D_5 + D_4 \qquad C = D_2 + D_1$$

Where D_i are the income deciles, ordered from low to high income. That is, D_1 corresponds to the lowest income decile, interpreted as the percentage of population whose computed disposable income falls in the first 10% income. The two transition deciles between the blocks, D_3 and D_7, have been intentionally removed in order to avoid that smooth transitions could hide the effects we are

looking for. Secondly, we define the inter-groups ratios (IGR) as the inequality indicators:

$$IGR_{AB} = \frac{A}{B} \qquad IGR_{BC} = \frac{B}{C} \qquad IGR_{AC} = \frac{A}{C}$$

This way, an increase in the IGR entails an improvement in the income distribution, as the population in the highest deciles increases relatively to those in the lowest deciles. Lastly, in order to test if the results are robust to the deciles used in each group, we also include an alternative version of this indicator. In this version, we include D_3 and D_7, and remove D_4 and D_8 instead:

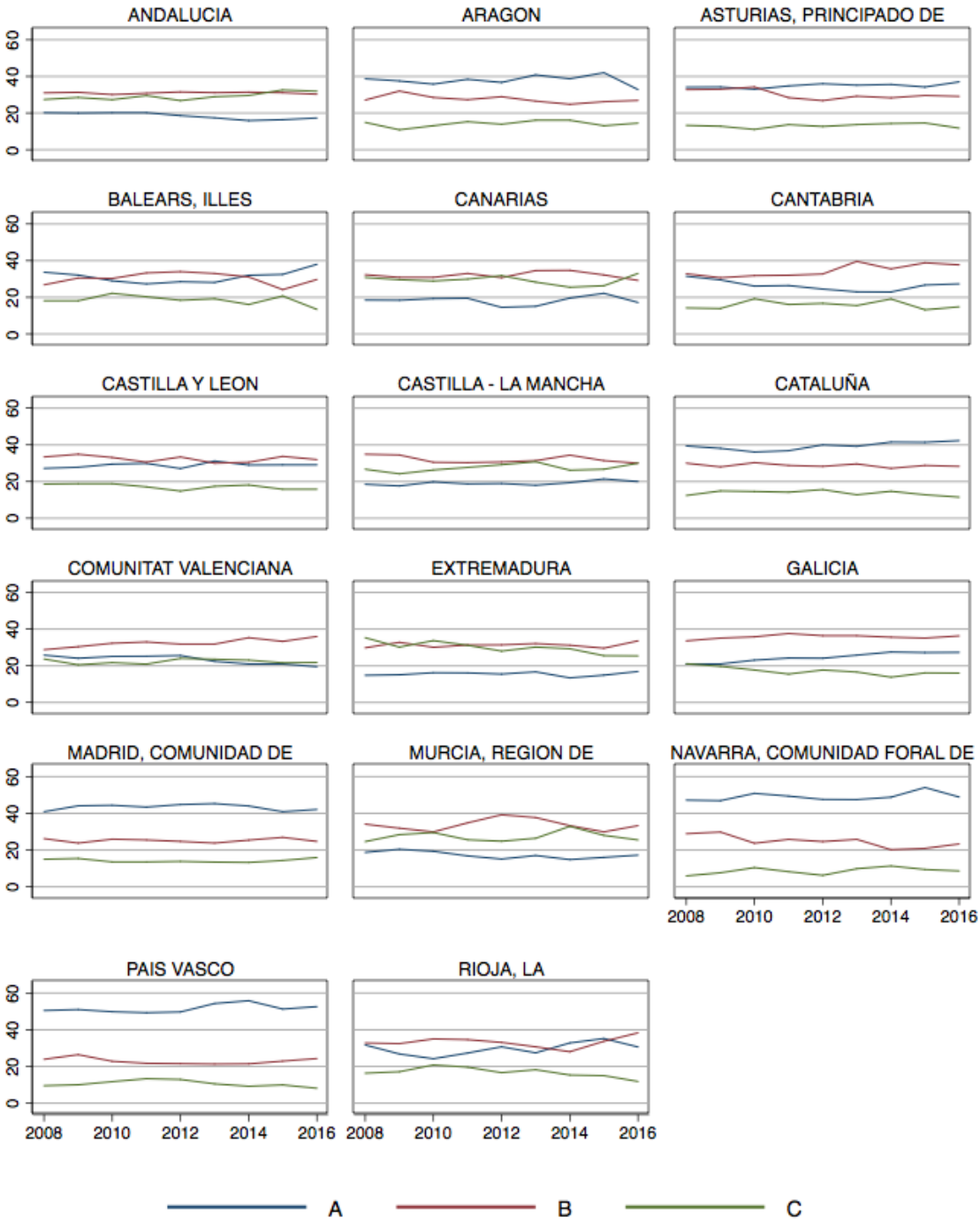
$$A' = D_{10} + D_9 \qquad B' = D_7 + D_6 + D_5 \qquad C' = D_3 + D_2 + D_1$$

Figure 1 shows the differences in each income group according to the first decile composition in the spatial and temporal dimensions. Regarding the spatial dimension, we see that in some regions high income deciles are quite larger than the low income ones. This is the case of Pais Vasco and Navarra, where *Group A* includes almost half of the population, while *Group C* is hovering around the 10%. This entails a fairer income distribution, as the wealth is shared by more people. On the other end, we find regions like Andalucia or Extremadura, where high income deciles represent at most 20% of the population. The concentration of wealth means that the income distribution is less equitable. Finally, in some regions (Comunitat Valenciana, Galicia) we observe that the majority of the population is allocated in the middle-income *Group B* which represents nearly the 40%.

The graphs also depict the evolution of the income distribution over the time period. On this dimension, we observe stability in some regions (Madrid, Cataluña) while other regions have suffered more changes over time (Murcia, Rioja). In some cases, we identify a pattern which could be defined as divergent: one income group rises while others decreases. For instance, in Cantabria and Comunitat Valenciana *Group B* tends to increase to the detriment of *Group A*. This means that a small

percentage of population tends to concentrate the wealth and the income distribution is worsened. The opposite is observed in Galicia, where *Group A* rises approaching *Group B*, while *Group C* drops below 20%. Another pattern that arises from the graphs is the alternation between periods of convergence and periods of divergence. For example, in Murcia we observe an initial convergence between *Groups B* and *C*, worsening the distribution, followed by the opposite process, with a fast rise in the middle-income deciles. This progression repeats again towards the end of the time period. Similar patterns are observed for Castilla y Leon and Castilla - La Mancha. Specially noticeable is the case of Balears, where the distribution worsens in the middle years (middle-income deciles rises above the high-income ones), but at the end the situation is reverted and the distribution improves (*Group A* increases and *Group C* decreases, while the medium deciles reach the initial level). In general, we observe that, except for some periods, the low-income deciles do not accumulate most of the population.

Figure 1: Percentage of population in each income group (by regions)



2. Import penetration

Regarding trade we collect micro-level data consisting in import operations reported to the *Agencia Estatal de la Administración Tributaria* (Spanish Tax Authority) between 2000 and 2016. This dataset provides very detailed information about the statistical value, 8-digit tariff codes, custom and destination provinces, country of origin and means of transport. Our database encompasses 19,623,402 single import operations. This data has been annually aggregated by regions. In order to measure the import penetration, we use the commonly used ratio of imports over GDP:

$$IP_{i,t}^{j} = \frac{M_{i,t}^{j}}{GDP_{i,t}}$$

where we distinguish two different categories *j*. In a first approach, we annually aggregate imports by region and type of goods. To do that we group the import operations by 3-digit tariff codes and use the NACE equivalence proposed in the *European Commission Regulation (EC) No 656/2007* of 14 June 2007 to aggregate them into five Main Industrial Groupings (MIGS): intermediate goods, energy, capital goods, consumer durables and consumer non-durable goods. These last two categories can be considered as final goods. Table 1 provides the number of 3-digit tariff codes that are aggregated into each MIG (for the complete correspondence between tariff codes and MIGS see the appendix).

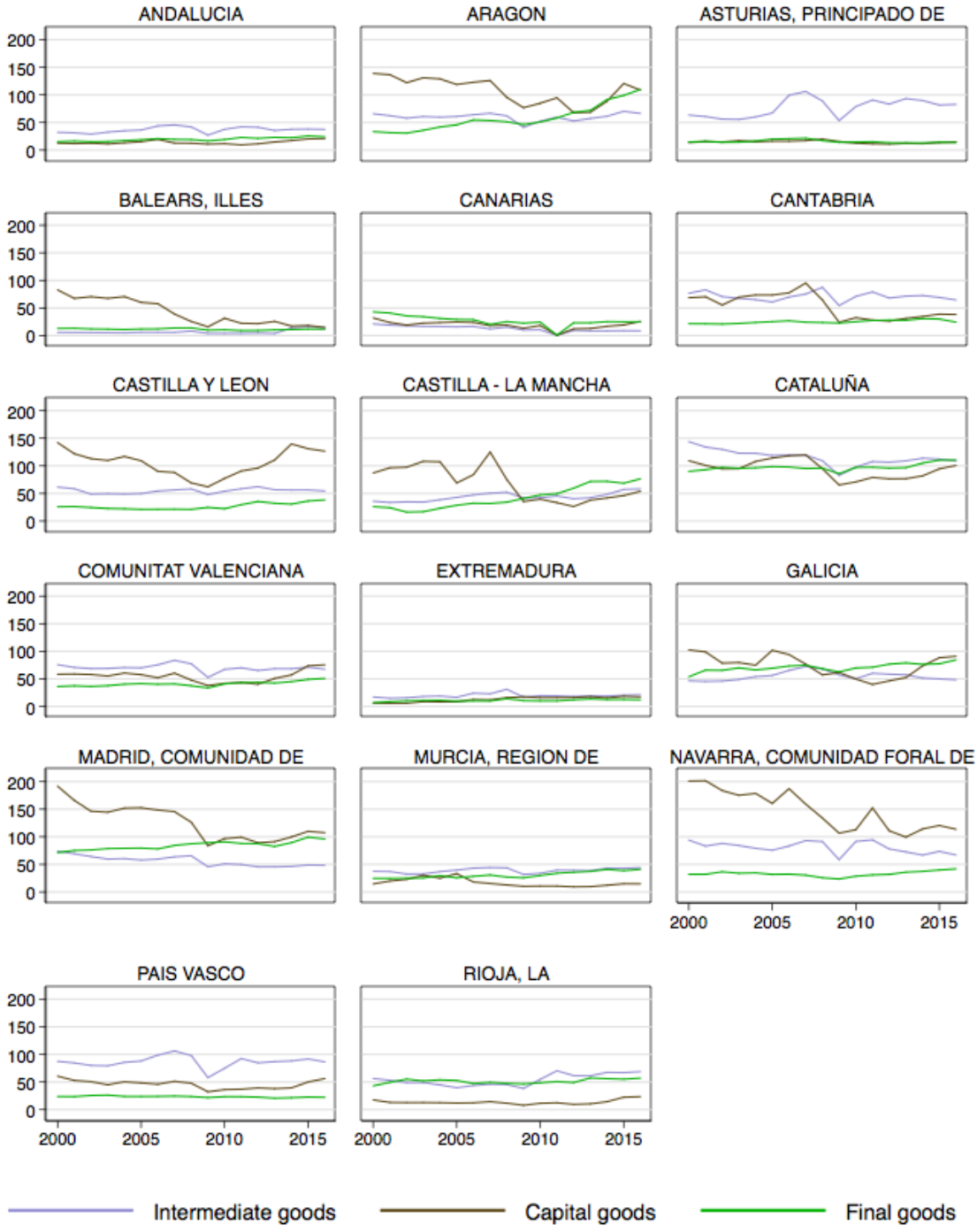
Table 1: Tariff codes aggregation into the five Main Industrial Groupings

Main Industrial Group	**No of tariff codes**
Intermediate goods	29
Energy	5
Capital goods	16
Final goods	25
Consumer durables	*7*
Consumer non-durables	*18*

Figure 2 shows the import penetration in each region, classified by the industrial groupings. We clearly observe that the import penetration for intermediate and capital goods fluctuates very much, while that for final goods is more or less stable during time. Particularly, we observe an important shock around 2008 that essentially affects intermediate and capital goods imports, meaning that the financial crisis hit the industry demand (which uses those products as inputs) more than the consumer demand for imported goods. This drop in the industrial imports may be caused by a shift in demand from domestic products to foreign ones, as pointed out by the slightly rise in final goods imports observed in almost all the regions.

The figure also evidences the differences in import penetration across regions. The most interesting picture of this heterogeneity is offered by capital goods. During the entire period, some regions have lowered the imports of these products (Balears, Castilla-La Mancha, Madrid). Other ones have kept them stable (Asturias) or have recovered the pre-crisis levels after the shock (Castilla y León, Cataluña, Galicia). Finally, some regions have increased slightly the imports (Comunitat Valenciana). We can observe similar patterns in intermediate goods import penetration, although they are in general more stable. Regarding final goods, they remain quite stable in some cases (Pais Vasco), while the general pattern is to increase. Specially remarkable are the cases of Aragon and Castilla-La Mancha.

Figure 2: Import penetration by type of good (industrial groupings)



In a second approach, we aggregate imports by region and country of origin. For simplification, we consider not each country but the main importing areas: European Union, Latin-American countries and China. As we can see in Table 2, the main importing countries are EU members. Especially noticeable is the rise of imports from China, so we include this country solely in our analysis. We also consider the Latin-American countries due to the historic and cultural linkages with Spain.

Table 2: Top 10 importing countries in 2000 (left) and 2016 (right)

Country	**Imports**	**Country**	**Imports**
France	27.050	Germany	36.190
Germany	24.590	France	28.210
Italy	14.780	China	23.040
United Kingdom	11.240	Italy	17.530
United States	7.517	United States	11.410
Netherlands	5.712	Netherlands	10.830
Belgium	5.241	Portugal	10.130
Japan	4.719	United Kingdom	9.810
China	4.639	Belgium	6.832
Portugal	4.329	Turkey	4.962

Additionally, we consider two control variables in our regressions. The first one is the industrial occupation, defined as the percentage of active population that works in the manufacturing sector. Traditionally, manufactures have been the most exposed sector to international trade and thus their workers are heavily affected by import competition. The second one is the self-employment rate, that is the percentage of active population that is self-employed. In Spain, most of the industrial activity is developed by entrepreneurs with medium-sized firms. Those have low protection and are very sensitive to crises and especially to import competition.

3. Econometric specification

To analyze the effects of import penetration on income distribution we formulate the following econometric model, where the subindex *i* represents regions and *t* represents the time in years:

$$IGR_{i,t} = \alpha + \beta_1 \, ln IP^{j}_{i,t} + \beta_2 \, IND_{i,t} + \beta_3 \, EMP_{i,t} + \delta_i + \varepsilon_{i,t}$$

$IGR_{i,t}$ is the dependent variable, that is the inter-group ratios. We consider alternate specifications for each ratio. $IP^{j}_{i,t}$ is the import penetration, where *j* represents both dimensions: the type of imported good or the country of origin. $IND_{i,t}$ and $EMP_{i,t}$ are the control variables, industrial occupation and self-employment. Finally, δ_i corresponds to a region fixed effect capturing time-invariant region-specific characteristics that potentially affect the income distribution, and $\varepsilon_{i,t}$ is the error term. We choose fixed effects as our estimation procedure because we want to consider region idiosyncrasies that do not vary over time.

IV. RESULTS

1. Main results

First of all, we estimate the distributional effects of the overall import penetration. As we can see from Table 3, the import penetration has no significant impact on the ratios. However, the existence of offsetting forces could be responsible of such an ambiguous result. Note that we are accounting for different imported goods that have not the same effect on the income distribution. On one hand, we may expect that intermediate and capital goods have a positive impact on income distribution as long as they are used as inputs in the local industries, thus improving employment and increasing wages in those sectors. On the other hand, final goods may have the opposite effect. That is, as direct competitors of local

products, imports can lower their domestic demand, which in turn leads to lower wages and unemployment in the affected sectors, worsening the income distribution. The same reasoning can be applied when we consider that the composition of imports (in terms of product types) differs across countries.

Table 3: Fixed Effect estimations for import penetration

	A/B	A/B	B/C	B/C	A/C	A/C
Import Penetration	0.00886	0.0200	0.149	0.151	0.188	0.205
	(0.0258)	(0.0202)	(0.108)	(0.103)	(0.145)	(0.157)
Industrial occupation		-0.0243		0.00028		-0.0273
		(0.0193)		(0.0362)		(0.0206)
Self-employment		-0.0078		0.00734		0.0156
		(0.0169)		(0.0585)		(0.0733)
Constant	0.998***	1.363***	1.038*	0.987	1.098	1.351
	(0.131)	(0.289)	(0.551)	(0.957)	(0.736)	(1.051)
Observations	153	153	153	153	153	153
R-squared	0	35	18	18	19	23

Therefore, our next step is to perform the same estimations considering different types of imported goods using the aforementioned industrial groupings. The fixed effects estimators are presented in Table 4 (for final goods jointly) and Table 5 (separately). When we distinguish imports by type of goods we observe that, as expected, intermediate and capital goods have a positive impact on the income distribution Particularly, higher levels of import penetration in intermediate goods entail a relative increase of income in *Group A* with respect to *Group B* and *Group C*, denoted by rises in IGR_{AB} and IGR_{AC} (more pronounced and significant for the last one). Moreover, the estimators for IGR_{BC} and IGR_{AC} are positive and significant for capital goods, meaning that larger volumes of imports in these goods cause increases in *Group A* and *Group B* with respect to *Group C*. The joint effect of intermediate and capital goods is very positive for the income distribution, as it causes a shift from low income deciles to high income ones.

Table 4: Fixed Effects estimations for import penetration, by types of goods (considering final goods jointly)

	A/B	A/B	B/C	B/C	A/C	A/C
IP, intermediate goods	0.127	0.150*	0.113	0.138	0.487**	0.557**
	(0.0967)	(0.0820)	(0.213)	(0.205)	(0.207)	(0.215)
IP, energy	-0.0304	-0.0369	0.0190	0.0118	-0.0432	-0.0607
	(0.0210)	(0.0222)	(0.0441)	(0.0434)	(0.0514)	(0.0534)
IP, capital goods	-0.0893	-0.0559	0.479**	0.517**	0.458*	0.545*
	(0.0784)	(0.0715)	(0.213)	(0.210)	(0.256)	(0.288)
IP, final goods	0.0230	0.00882	-0.228	-0.244	-0.313*	-0.351*
	(0.0579)	(0.0511)	(0.151)	(0.150)	(0.159)	(0.174)
Industrial occupation		-0.0282		-0.0315		-0.078***
		(0.0171)		(0.0308)		(0.0252)
Self-employment		-0.000225		-0.00380		0.0188
		(0.0132)		(0.0457)		(0.0623)
Constant	0.841***	1.158***	0.699	1.074	0.157	0.915
	(0.245)	(0.356)	(0.681)	(0.965)	(0.804)	(0.925)
Observations	153	153	153	153	153	153
R-squared	0.055	0.093	0.109	0.116	0.120	0.147

The coefficient for energy imports is not significant at any level, meaning that these products entail no distributional effects. As predicted, final goods have a negative impact on distribution, causing decreases in IGR_{AC}. These effects result in movements from high income deciles (*Group A*) to the lowest ones (*Group C*). It is important to notice that in this category we are accounting for two types of final goods. Especially, when we disentangle these into durable and non-durable consumer goods, we notice that durable goods have a strong negative impact on IGR_{AC} (significant at 5%), whereas no significant effects are found for non-durable goods.

Table 5: Fixed Effects estimations for import penetration by types of imported goods (considering durable and consumable goods separately)

	A/B	A/B	B/C	B/C	A/C	A/C
IP, intermediate goods	0.116	0.144	0.110	0.147	0.474**	0.563**
	(0.0986)	(0.0851)	(0.222)	(0.210)	(0.217)	(0.227)
IP, energy	-0.0401	-0.0407	0.0163	0.0171	-0.0547	-0.0568
	(0.0267)	(0.0265)	(0.0498)	(0.0493)	(0.0529)	(0.0528)
IP, capital goods	-0.0562	-0.0449	0.488**	0.502**	0.498**	0.534*
	(0.0589)	(0.0596)	(0.184)	(0.194)	(0.232)	(0.268)
IP, consumer durables	-0.0372	-0.0179	-0.245*	-0.207	-0.385**	-0.324**
	(0.0452)	(0.0439)	(0.135)	(0.130)	(0.150)	(0.133)
IP, consumer non-durables	0.0839	0.0394	-0.210	-0.286	-0.241	-0.382
	(0.104)	(0.0998)	(0.235)	(0.225)	(0.219)	(0.262)
Industrial occupation		-0.0253		-0.0355		-0.081**
		(0.0148)		(0.0277)		(0.0301)
Self-employment		0.00409		-0.00974		0.0144
		(0.0163)		(0.0422)		(0.0568)
Constant	0.672***	1.019***	0.651	1.264	-0.0438	1.056
	(0.194)	(0.269)	(0.590)	(0.770)	(0.746)	(0.772)
Observations	153	153	153	153	153	153
R-squared	0.071	0.096	0.109	0.117	0.123	0.147

Additionally, we perform the estimations based on the origin of imports, grouping imports in four main areas: European Union, Latin-America, China and the rest of the world. As we can see in Table 6, imports from EU members have a positive and significant effect (at 5%) on income distribution, as they entail increases in both IGR_{BC} and IGR_{AC}. In contrast, Latin-American and Chinese imports have no significant impact.

Table 6: Fixed Effects estimations for import penetration by origin of imports

	A/B	A/B	B/C	B/C	A/C	A/C
China	-0.0433	-0.0421	0.0674	0.0654	-0.000867	0.0112
	(0.0614)	(0.0577)	(0.115)	(0.114)	(0.103)	(0.129)
European Union	0.0479	0.0660	0.318**	0.323**	0.502**	0.519**
	(0.0790)	(0.0616)	(0.144)	(0.141)	(0.208)	(0.209)
Latin-America	0.0121	0.00759	-0.0363	-0.0384	0.0292	0.0293
	(0.0347)	(0.0354)	(0.0452)	(0.0530)	(0.116)	(0.118)
Rest of the world	-0.00286	-0.00293	-0.147	-0.146	-0.291	-0.297
	(0.0436)	(0.0405)	(0.112)	(0.117)	(0.227)	(0.233)
Industrial occupation		-0.0249		-0.00386		-0.0349
		(0.0190)		(0.0354)		(0.0248)
Self-employment		-0.0105		-0.00613		0.00582
		(0.0186)		(0.0625)		(0.0810)
Constant	0.916***	1.288***	0.838	0.915	0.847	1.280
	(0.215)	(0.365)	(0.503)	(0.844)	(0.816)	(1.001)
Observations	153	153	153	153	153	153
R-squared	0.008	0.045	0.051	0.051	0.072	0.078

2. Robustness check

Finally, as a robustness check, we perform the same estimations changing the decile composition in each group. The results are shown in Tables 7 to 10. As expected, the overall import penetration does not affect any of the distributional ratios, which supports our previous results.

Table 7: Fixed Effect estimations for import penetration (alternative group composition)

	A/B	A/B	B/C	B/C	A/C	A/C
Import penetration	0.0110	0.00807	0.0521	0.0617	0.0460	0.0515
	(0.0126)	(0.0131)	(0.0388)	(0.0400)	(0.0318)	(0.0351)
Industrial occupation		-0.00027		-0.0278*		-0.0256
		(0.0070)		(0.0138)		(0.0154)
Self-employment		-0.0168		-0.0264		-0.0428*
		(0.0149)		(0.0474)		(0.0202)
Constant	0.590***	0.702***	0.956***	1.487***	0.655***	1.264***
	(0.0642)	(163)	(198)	(369)	(162)	(273)
Observations	153	153	153	153	153	153
R-squared	2	16	8	40	9	70

Table 8: Fixed Effects estimations by types of imported goods (considering final goods jointly) (alternative group composition)

	A/B	A/B	B/C	B/C	A/C	A/C
IP, intermediate goods	0.0851*	0.0843*	0.0409	0.0691	0.147*	0.170**
	(0.0467)	(0.0451)	(0.0814)	(0.0747)	(0.0827)	(0.0736)
IP, energy	-0.0271	-0.0279	0.0316	0.0210	0.00761	-0.00220
	(0.0197)	(0.0207)	(0.0357)	(0.0337)	(0.0287)	(0.0263)
IP, capital goods	-0.0394	-0.0325	0.211*	0.272**	0.0912	0.150
	(0.0475)	(0.0429)	(0.101)	(0.113)	(0.0862)	(0.0896)
IP, final goods	0.0147	0.0122	-0.116	-0.141*	-0.0803	-0.104*
	(0.0224)	(0.0202)	(0.0723)	(0.0698)	(0.0571)	(0.0552)
Industrial occupation		-0.00308		-0.044**		-0.041**
		(0.00687)		(0.0153)		(0.0164)
Self-employment		-0.0120		-0.0316		-0.040**
		(0.0128)		(0.0415)		(0.0164)
Constant	0.457***	0.563***	0.794***	1.479***	0.370	1.063***
	(0.104)	(0.186)	(0.265)	(0.387)	(0.233)	(0.266)
Observations	153	153	153	153	153	153
R-squared	0.073	0.083	0.076	0.141	0.064	0.159

Regarding the import classification in industrial groupings, our results are quite robust to the decile composition. We can observe that the distributional effects are not so strong (coefficients are quite lower) although the significance holds for intermediate goods. In the case of capital goods, import penetration has only significant effects on the IGR_{BC}. On the other hand, the effects have also lowered for final goods. Import penetration for these goods has negative significant effects on IGR_{BC} and IGR_{AC}. As expected, higher import penetration on final goods entails lower income: *Group A* and *Group B* decrease with respect to *Group C*. In contrast, when we consider durable and non-durable goods separately, no significant effects are found in any case.

Table 9: Fixed Effects estimations by type of imported good (considering durable and non-durable consumer goods) (alternative group composition)

	A/B	A/B	B/C	B/C	A/C	A/C
IP, intermediate goods	0.0860*	0.0898*	0.0257	0.0691	0.138	0.181**
	(0.0466)	(0.0432)	(0.0748)	(0.0738)	(0.0791)	(0.0729)
IP, energy	-0.0262	-0.0246	0.0179	0.0210	-0.000343	0.00447
	(0.0218)	(0.0217)	(0.0390)	(0.0383)	(0.0335)	(0.0295)
IP, capital goods	-0.0423	-0.0420	0.257**	0.272**	0.118	0.131
	(0.0406)	(0.0408)	(0.121)	(0.125)	(0.0917)	(0.0940)
IP, consumer durables	0.0198	0.0354	-0.201	-0.141	-0.130	-0.0576
	(0.0266)	(0.0257)	(0.119)	(0.104)	(0.0913)	(0.0753)
IP, consumer non-durables	0.00945	-0.0143	-0.0303	-0.141*	-0.0304	-0.156
	(0.0493)	(0.0414)	(0.0644)	(0.0800)	(0.0618)	(0.0942)
Industrial occupation		-0.00561		-0.044**		-0.046**
		(0.00530)		(0.0173)		(0.0192)
Self-employment		-0.0158		-0.0315		-0.047**
		(0.0124)		(0.0416)		(0.0178)
Constant	0.471***	0.683***	0.554	1.478**	0.231	1.302***
	(0.115)	(0.156)	(0.395)	(0.535)	(0.318)	(0.436)
Observations	153	153	153	153	153	153
R-squared	0.074	0.089	0.091	0.141	0.072	0.165

If we distinguish imports according to their origin, the significance drops considerably. Only in one case, our estimator for import penetration corresponding to the EU trade partners is significant at 10%. In this case, we find that our results are not robust to variations in the income group composition.

Table 10: Fixed Effects estimations for import penetration by origin of imports (alternative group composition)

	A/B	A/B	B/C	B/C	A/C	A/C
IP, China	0.0334	0.0248	-0.00587	-0.0140	0.0444	0.0329
	(0.0509)	(0.0450)	(0.0786)	(0.0869)	(0.0698)	(0.0791)
IP, European Union	0.00624	0.0147	0.120	0.150	0.0909	0.123*
	(0.0693)	(0.0626)	(0.0903)	(0.110)	(0.0804)	(0.0690)
IP, Latin-America	-0.0117	-0.0174	0.0114	9.95E-06	0.0391	0.0257
	(0.0136)	(0.0171)	(0.0513)	(0.0547)	(0.0612)	(0.0614)
IP, rest of the world	0.00388	0.00852	-0.0588	-0.0537	-0.111	-0.104
	(0.0557)	(0.0501)	(0.116)	(0.119)	(0.107)	(0.105)
Industrial occupation		-0.00123		-0.0295*		-0.0292
		(0.00732)		(0.0144)		(0.0175)
Self-employment		-0.0178		-0.0317		-0.0381
		(0.0146)		(0.0507)		(0.0272)
Constant	0.550***	0.643***	0.899***	1.422***	0.728**	1.275***
	(0.119)	(0.196)	(0.262)	(0.420)	(0.272)	(0.390)
Observations	153	153	153	153	153	153
R-squared	0.015	0.031	0.023	0.060	0.049	0.111

V. CONCLUSIONS

In short, our study has shown that import penetration has a significative impact on the income distribution, although its sign mainly depends on the type of imported goods. Disentangling the effects we find that intermediate and capital goods affect positively the income distribution, increasing the high-income with respect to low-income groups. As expected, final goods have the opposite effect.

When we separate this category into durable and non-durable goods, we find that the first ones have a strong impact, while the last ones are not significant for the income distribution. Additionally, we find evidence that industrial occupation is a determinant factor in some cases.

These offsetting effects may result in more or less income inequality depending on their magnitude. As pointed out in section III, import penetration in intermediate and capital goods have lowered as a consequence of the 2008 financial crisis. At the same time, a shift in final consumption from domestic to imported products could be the reason why in the last years the income distribution has worsened. However, this pattern is not homogeneous for Spanish regions. Apart from the import penetration, there could be other factors, such as the social expenditure or the level of education, that affect the income distribution.

Regarding the origin of imports, in our case, it plays no significant role on the income distribution. An exception is the European Union, which could be caused by the fact that most of the imports from the EU include intermediate and capital goods, whereas those from other areas are quite more heterogeneous. Specially shocking is the case of China. Contrary to other studies (see Mion and Zhu, 2013), our results suggest that the import competition from this country has no impact. As mentioned before, the complexity of Chinese imports, in the form of a wide variety of products, may be responsible of such an ambiguous result. It would be interesting to deep into the analysis.

On the whole, our results are consistent and quite intuitive. Nonetheless, we should also take into account the limitations of our analysis. First of all, we would like to point out that the division of income in deciles is not homogeneous across regions, so the income groups are not comparable. Given that each region has a different wealth level, the same group in one region may correspond to a higher income in another one. Additionally, for the import penetration we consider five main industrial groupings. In further studies, it would be interesting to analyze thoroughly the import competition in specific sectors.

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VII. APPENDIX

Table 11: Equivalence between 3-digit tariff codes and MIG classification

Code	NACE description
Intermediate goods	
7	Mining of metal ores
8	Other mining and quarrying
9	Mining support service activities
10.6	Manufacture of grain mill products, starches and starch products
10.9	Manufacture of prepared animal feeds
13.1	Preparation and spinning of textile fibres
13.2	Weaving of textiles
13.3	Finishing of textiles
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
17	Manufacture of paper and paper products
20.1	Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms
20.2	Manufacture of pesticides and other agrochemical products
20.3	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
20.5	Manufacture of other chemical products
20.6	Manufacture of man-made fibres
22	Manufacture of rubber and plastics products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25.5	Forging, pressing, stamping and roll-forming of metal; powder metallurgy
25.6	Treatment and coating of metals; machining
25.7	Manufacture of cutlery, tools and general hardware
25.9	Manufacture of other fabricated metal products
26.1	Manufacture of electronic components and boards
26.8	Manufacture of magnetic and optical media
27.1	Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus
27.2	Manufacture of batteries and accumulators
27.3	Manufacture of wiring and wiring devices

27.4	Manufacture of electric lighting equipment
27.9	Manufacture of other electrical equipment

Energy	
5	Mining of coal and lignite
6	Extraction of crude petroleum and natural gas
19	Manufacture of coke and refined petroleum products
35	Electricity, gas, steam and air conditioning supply
36	Water collection, treatment and supply

Capital goods	
25.1	Manufacture of structural metal products
25.2	Manufacture of tanks, reservoirs and containers of metal
25.3	Manufacture of steam generators, except central heating hot water boilers
25.4	Manufacture of weapons and ammunition
26.2	Manufacture of computers and peripheral equipment
26.3	Manufacture of communication equipment
26.5	Manufacture of instruments and appliances for measuring, testing, and navigation; watches and clocks
26.6	Manufacture of irradiation, electro medical and electrotherapeutic equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles, trailers and semi-trailers
30.1	Building of ships and boats
30.2	Manufacture of railway locomotives and rolling stock
30.3	Manufacture of air and spacecraft and related machinery
30.4	Manufacture of military fighting vehicles
32.5	Manufacture of medical and dental instruments and supplies
33	Repair and installation of machinery and equipment

Consumer durables	
26.4	Manufacture of consumer electronics
26.7	Manufacture of optical instruments and photographic equipment
27.5	Manufacture of domestic appliances

30.9	Manufacture of transport equipment n.e.c.
31	Manufacture of furniture
32.1	Manufacture of jewellery, bijouterie and related articles
32.2	Manufacture of musical instruments

Consumer non-durables

10.1	Processing and preserving of meat and meat products
10.2	Processing and preserving of fish, crustaceans and molluscs
10.3	Processing and preserving of fruit and vegetables
10.4	Manufacture of vegetable and animal oils and fats
10.5	Manufacture of dairy products
10.7	Manufacture of bakery and farinaceous products
10.8	Manufacture of other food products
11	Manufacture of beverages
12	Manufacture of tobacco products
13.9	Manufacture of other textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
18	Printing and reproduction of recorded media
20.4	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
32.3	Manufacture of sports goods
32.4	Manufacture of games and toys
32.9	Manufacturing n.e.c.