The Effect of Exports on Labor Informality: Evidence from Argentina*

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Abstract

This paper explores the causal impact of exports on the share of informal labor in the Argentinean manufacturing sector. Using an instrumental variable approach to address potential endogeneity concerns, I show that an exogenous 10 percentage point increase in export intensity induces a reduction of the informality rate of 7 percent. Then, I explore the channel through which exports affect informality. By differentiating exports according to the income group of their destinations, I find that the aggregate effect of exports is explained by the sales to high-income countries. Moreover, the effect is partially explained by an increase in the complexity of the tasks performed in the jobs. Overall, the evidence suggests that under an increase in the demand of higher quality exports, the manufacturing firms increase their productivity by reducing their share of informal workers.

JEL Classification: F16, F66, J24, J46.
Keywords: Exports, Labor Informality, Productivity, Task Complexity, Argentina.

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1 Introduction

Informal employment, understood as jobs outside the formal labor market regulations and social protection schemes, is one of the leading policy issues in developing countries. In particular, it represents a major problem in terms of social protection, due to the lack of recognition of labor rights and insurance against changes in labor market conditions. Moreover, labor informality affects tax revenues since it undermines government tax collection and, therefore, the provision of public goods (Johnson, Kaufmann and Shleifer, 1997). In Latin America, labor informality remains a pervasive characteristic of labor market, ranging from around 25% of total employment in Chile and Uruguay to around 60% in many countries, including Bolivia, Ecuador and Mexico, among others (Gasparini and Tornarolli, 2009). Between 1990 and 2001, this region has doubled its exports[1]. This expansion is in part due to a process of trade liberalization, the increase in world trade, and also the implementation of specific policies to promote exports. Nevertheless, the research on the effects of international trade, and in particular of exports, on informal employment is scarce.

Exports affect local labor markets and may affect informality in different directions. On the one hand, price competition to enter and succeed in export markets may induce firms to hire informal workers or subcontracting with establishments in the informal sector in order to reduce labor costs.[2] For example, Acosta and Montes-Rojas (2014) argue that in developing countries low enforcement of labor market regulations provides higher flexibility for firms to adjust to trade exposure by self-selecting into different degrees of formality. On the other hand, tougher competition in response to a demand shock in the country of destination may mean that workers are reallocated towards more upgraded products, with higher quality. This may mean that more workers are hired formally provided that most unskilled are informally employed. Thus, the question is which effect dominates.

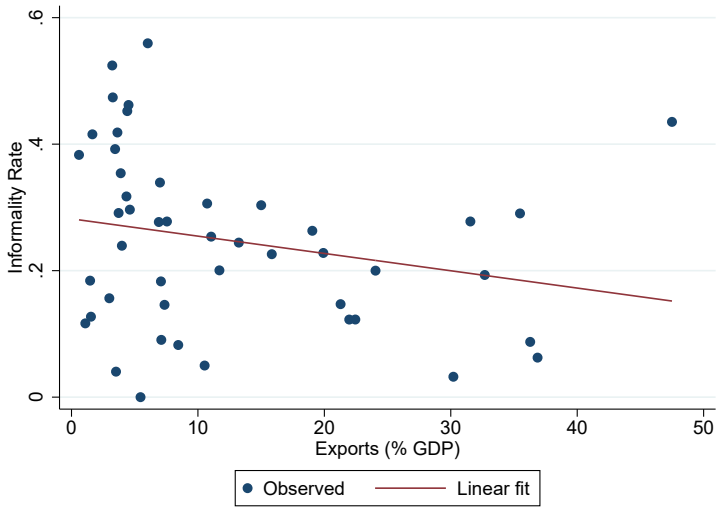
In this paper, I assess the causal impact of changes in export intensity on the probability of having an informal job in Argentinean manufacturing sector. In order to identify this effect, I exploit the cross-sectional and time variability of direct exposure to exports' demand shocks across industries for the period 1997-2001. Argentina constitutes a good case to study the effect of interest in a developing economy for two main reasons. First, labor informality

[1] Own calculations based on *World Development Indicators*(WDI), The World Bank data, considering the exports of goods and services measured at constant 2005 US$.

[2] Increased competition in foreign markets may hamper the survival of formal firms exposed to it. Informal employment allows these firms to diminish the impact of certain shocks by hiring more flexible inputs (Bacchetta, Ernst and Bustamante, 2009).

represents 33% of total employment in the manufacturing sector.[3] This percentage is close to the Latin American average (Gasparini and Tornarolli, 2009). Second, manufacturing exports account for 66% of Argentinean exports on average for this period. In Figure 1, we observe the relationship between the mean of exports (as a share of GDP) and informality rate of the period 1997-2001 by manufacturing industry. The linear prediction for the informality share indicates a significant negative correlation between exports and informality variables of 0.18.

Figure 1: Average Informality Rate and Exports in Manufacturing Industries, Argentina (1997-2001)



Notes: Each observation corresponds to a manufacturing industry at 3-digits level of the International Standard Industrial Classification (ISIC), Rev. 3. Labor informality Rate is computed based on the Legalistic definition on wage-earners. The solid line is the linear prediction for the informality rate. Source: Own calculations based on Ministry of Industry, and Encuesta Permanente de Hogares (EPH) data of Argentina.

This evidence suggests a strong relationship between the two variables, but it is not possible to infer any causality from it. Given potential concerns about omitted variables bias and reverse causality problems, I follow an instrumental variable approach by exploiting the within-industry exogenous variation of exports over time driven by an external demand shock, generated by the change in real income of its destination countries. Regression results on the effect of export on labor informality show that an exogenous increase of exports of 10 percentage points reduces 2.2 percentage points, on average, the probability of job informality

[3]Own calculations based on Encuesta Permanente de Hogares (EPH) data for the period 1997-2001, using the *Legalistic/Social protection* definition of informality described in section 2, considering only wage-earners.

in the Argentinean manufacturing sector.

In addition to exploring the short-term changes in labor force composition in the manufacturing sector, I seek to identify the mechanism behind the effect. There is evidence that exporting to high-income countries increases firms' productivity and requires higher skills compared to exporting to other destinations (see, for example, Marin, 1992 and De Loecker, 2007 studies for developed countries, and Park et al., 2010 and Brambilla, Lederman and Porto, 2012 for developing ones). If the 'productivity channel' partially explains the effect of exports on labor informality, we should observe two facts. First, increasing exports to high-income destinations should reduce informality. Second, for low-income countries this effect should not be observed. Consistently with this explanation, I find that the aggregate negative effect of exports on the informality rate is due to sales to high-income destinations, which significantly decreases around 3.8 percentage points when the export intensity to these countries rises by 10 percentage points. This evidence is in line with the idea that a foreign demand shock may induce industries to increase their productivity by reducing the share of informal (usually less skilled) workers.

One possible way of increasing firm productivity may be via an increase in the complexity of the tasks performed in the jobs. I estimate the effect of exports on industry informal share that comes through its effect on task complexity in three stages. First, I obtain the exogenous predicted value of exports driven by the exogenous demand shock in a first stage. Then, I use this variable as an instrument of a dummy indicator of high complexity task jobs in a regression of task complexity on labor informality. I obtain that an increase in 10 percentage points in the export intensity reduces by approximately 1.8 percentage points informality rate through an increase in the average complexity of the jobs. Thus, the increase in complexity of the tasks explains 80% of the total effect. Overall, this evidence suggests that under an increase in demand for higher quality exports, the manufacturing firms reduce the share of informal labor force as a mean of increasing their productivity.

Previous studies have assessed the effects of globalization on domestic labor markets. In particular, Autor et al. (2014); Acemoglu et al. (2014), and Autor, Dorn and Hanson (2015) focus on the consequences of international competition for local wages and employment at the industry level finding that more competition in international markets has a negative effect on these variables. Pierce and Schott (2014), similarly, tests U.S. manufacturing employment growth for plants that faced a larger potential competition from China. For developing countries, Goldberg and Pavcnik (2007) study the effects of globalization on income inequality. Complementing these studies, I explore a different direct effect of international trade

on the composition of manufacturing employment, focusing on a developing country where labor informality is in particular relevant and, as I show, a potential alternative margin of adjustment of industries to certain shocks.

Trade reforms may have adverse effects in terms of replacing formal jobs with informal ones (Goldberg and Pavcnik, 2003). This possibility has led to an increasing research on the effects of trade reforms on employment composition. Most of this literature focuses on the effects of trade liberalization on labor informality, but the empirical evidence is non-conclusive. Based on internationally comparable data, Fiess and Fugazza (2010) obtain mixed results depending on the data and econometric framework. In the case of Paz (2014); Bosch, Goni and Maloney (2012), and Goldberg and Pavcnik (2003), they find little evidence of a significant impact of trade policy changes on informality in Brazil and Colombia. On the other hand, Acosta and Montes-Rojas (2014) and Cruces, Porto and Viollaz (2014) identify an increase in labor informality following trade openness for Argentina, while Aleman-Castilla (2006) finds a decrease in informality using data for Mexico.

The study by Paz (2014) is the most closely related to our paper. He looks at the simultaneous effects of Brazilian domestic and trading partner import tariffs changes from trade openness, finding a decrease in the share of manufacturing domestic informal employment under a reduction of the last, which is consistent with our empirical evidence. However, trade liberalization affects simultaneously exports and imports through the elimination of trade barriers and tariff reduction. This does not allow their effects to be isolated separately. Hence, the limited empirical evidence I does not yield strong conclusions concerning the link between trade and informality in a developing economy, nor does it provide any prediction on how exports represent a distinct effect. In this paper I provide consistent evidence on the effects of exports on labor informality in a developing country, and show that only exports to high income countries are relevant to reduce informality. Unlike a trade liberalization process, policies to incentive exports are implementable in different ways, being of a major concern to understand the potential effects of exports on informality.

Finally, one strand of the literature has studied the determinants of labor informality. While some studies emphasize the role of labor market regulation and taxation as the main determinants of labor informality (De Soto, 1989; Almeida and Carneiro, 2012, among others), Fields (1990) and Maloney (2004) highlight the issue of voluntary informal employment, identifying a segmentation within informal labor. The research on the determinants of labor informality is increasing. Despite the dynamism within the labor market given by the expansion of world trade, decent working conditions have not improved at the same rate

and the informal economy in developing countries remains persistently large (Bacchetta, Ernst and Bustamante, 2009). One possible explanation is that trade exposure increases pressure on firms to reduce labor costs by cutting worker benefits, replacing permanent workers with part-time labor, or subcontracting with establishments in the informal sector, and self-selecting into different degrees of informality (Goldberg and Pavcnik, 2003). Thus, investigating how exports affect labor informality and the potential channels behind would help us to understand in more depth this multifaceted phenomenon.

This paper proceeds as follows. Section 2 introduces the data sources and descriptive statistics. Section 3 describes the empirical strategy and presents and discusses results for exports effects on labor informality. Section 4 presents evidence on the transmission mechanisms of exports. Section 5 concludes.

2 Data and Descriptive Statistics

In this section I present statistical evidence on Argentinean manufacturing industries related to exports and informal employment, and the task complexity of the jobs performed by formal and informal workers. Furthermore, I briefly describe the data sources and relevant definitions I use for the empirical analysis.

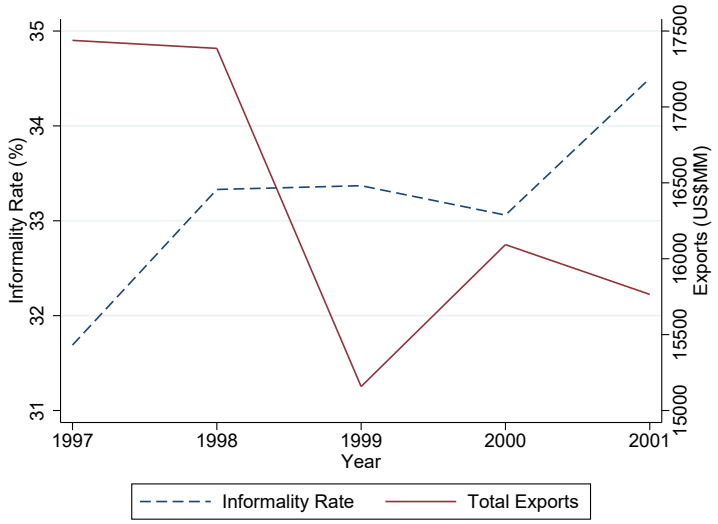
Using official survey and administrative data of Argentinean manufacturing industries for the period 1997-2001, in this paper I estimate the impact of changes in export intensity on labor informality and analyze the mechanisms behind this effect. The time span was selected because of specific features of the Argentinean economy. First, in this period, macroeconomic conditions, in particular exchange rate and inflation, were relatively stable.[4] Second, by 1997, the economy had already mostly adjusted to the trade liberalization process initiated in 1990.[5] This makes it easier to identify the effect of exports independently of the effect of a particular trade policy. Finally, during this period some Argentinean exports were affected by a negative demand shock, explained by the devaluation of the Brazilian national currency at the beginning of the year 1999. This provides a source of variation across industries on the explanatory variable, something necessary for the proper identification of the estimated effect. Figure 2 displays the evolution of the informality rate and exports value of goods and

[4] I decided to limit the period until 2001, since in January 2002 Argentina has devaluated its currency Peso and has reformed the exchange rate regime that became fully floating.

[5] A gradual trade liberalization process has already begun in 1988 but from 1990 to 1994, Argentina has implemented a broad liberalization process that included a regional trade agreement (i.e. the Mercosur, 'Common Market of the South').

services in the manufacturing sector. We observe that these two variables present an inverse dynamic over 1997-2001. In particular, this sector exhibits a fall of the level of exports and a significant increase in the share of informal workers.[6] The aggregate evolution reflects the variability of industries' exports level. In particular, the contraction in 1999 indicates the negative demand shock to the manufacturing sector driven by Brazilian currency devaluation, as an aggregate.

Figure 2: Evolution of Informality and Exports in the manufacturing sector (1997-2001)



Notes: The informality rate is measured according to the legalistic definition, considering only wage-earners. Exports measures the total value of exports of goods and services of manufacturing sector in million US$ current prices. Source: Own calculations based on Ministry of Industry, and Encuesta Permanente de Hogares (EPH) data of Argentina.

The measurement of labor informality is difficult to implement empirically. Ideally, we would like to have matched employer-employee level data to perform a more detailed analysis taking into account not only workers' observable characteristics but also firms' ones. However, one of the main limitations for Argentina (and, indeed, most countries) is that matched employer-employee data allows to identify only the formal workers employed by the firms. This makes it necessary to focus on the industry level to analyze labor informality related issues. The main source of data I use in my analysis is the national micro-level

[6]The manufacturing sector represents a significant part of the total exports of the Argentinean economy, accounting for around 66% of the total exports and 24% of total registered employment in 1998. Source: Ministry of Industry, Argentina.

household and labor force survey, the *Encuesta Permanente de Hogares* (EPH), carried out by the national institute of statistics and census, *Instituto Nacional de Estadisticas y Censos* (INDEC).[7] This micro-level survey, which covers large urban agglomerations, has an approximate coverage of 70% of the urban population and 60% of the total population.[8] One important feature of this survey is that it provides information at the individual-level relevant to identify the informality status of the workers and their industry of employment, aggregated at 3-digits level, according to international classifications (i.e. International Standard Industrial Classification (ISIC), revision 3).[9] This industry disaggregation provides enough degrees of freedom to the empirical estimation analysis. Moreover, it includes a vast list of variables of individual and household characteristics, some of which will serve as controls for the identification of the estimated effect or to disentangle its transmission mechanisms.

The literature on informality uses two main standard definitions to classify a worker as informal: 'Legalistic' (or 'Social Protection') and 'Productive'. In the former definition, an individual is working informally if her/his job is not recognized, regulated or protected by the existing legal framework. According to the 'Productive' definition, a worker is classified as informal if (s)he works at a firm with low capital endowment, low productivity, unskilled or marginal small-scale jobs (ILO, 2013). Compared to the legalistic definition, this definition focuses more on the characteristics of the firm rather than the coverage of workers by labor laws. Both the legalistic and the productive definitions give broadly similar measures of the informality rate in Argentina.[10]

While we may be interested in analyzing the effect of export on labor informality for all the remunerative work (i.e. both self-employment and salaried), self-employed workers have different motivations and skills to wage-earners (see, for example, Perry et al., 2007). Hence, I focus only on salaried workers abstracting from the decision of working as self-employed, and use the legalistic measure of informality. Considering the variables in the EPH survey,

[7] Similar surveys have extensively been used as the main source of data by previous empirical analyses on labor informality. More detailed information of the EPH is in data Appendix A.

[8] I consider all the urban agglomerations (28). However, the EPH survey has a 100% coverage of only Buenos Aires agglomeration (Capital City and Great Buenos Aires). This agglomeration is the main statistical region, which accounts for more than 50% of total GDP and represents around 33.5% of Argentinean population. As robustness check, I also pursue the empirical analysis on Buenos Aires with similar results.

[9] I aggregate some of these sectors following the classification used by the Ministry of Economics based on ISIC, that takes into account the particular characteristics of these sectors for the Argentinean economy. This gives a total of 47 industries. Appendix B displays the list of sectors with a brief characterization.

[10] Despite depending on the definition the same salaried worker can be classified as formal/informal, the overlap between classifications is of more than 76%. Note that the EPH allows to use the legalistic measure only to classify the wage-earners.

this definition provides a more precise identification of the informality status of the workers. Consistently with the trend exhibited in the literature, I construct an indicator of informality status based on whether the worker is registered in the social security system (i.e. if (s)he does not have the right of a pension associated with the occupation). I leave the productive definition for robustness analyses.

Labor informality in the Argentinean manufacturing sector is 33.3% on average for the period 1997-2001.[11] In order to understand the differences in terms of observable characteristics between formal and informal salaried workers, I report in Table 1 the main relevant summary statistics of the control variables used for the empirical estimation. This table considers the pooled sample of manufacturing sector's workers for the five years of analysis (applying individual sampling weights for the computations). The sample includes 26,640 full-time (i.e. more than 20 hours worked) paid workers. I restrict the analysis only to individuals of working age (i.e. between 15 and 65 years of age). Regardless the informality status, most workers in the manufacturing sector are male. Even the distribution of these two groups overlap in terms of the observable characteristics, test of differences in means reveals a significant difference between them in terms of these variables.

Workers informally employed in manufacturing sector are on average younger than those formally employed. This might indicate that the youth decides to enter in the labor market as informal wage-earners and later they become formal or enter in self-employment. In addition, informal workers are significantly less skilled than formal ones in terms of educational level, with an incomplete secondary school level on average. The higher variability in the educational achievement within formal employees compared to informal ones may reflect the fact that they can be employed in a vast range of occupations (including the ones of informal workers), with different education requirement. On the contrary, informal workers may work in only some particular kind of occupation with lower educational requirements. Working informally can be used as a way of complementing the household income. In line with this possibility, we observe that while most formal workers are heads of households, informal workers are not, and adult-equivalent income is significantly lower, on average, for the informal workers. Furthermore, entering informality may be associated to the gains in terms of flexibility to attend family life, as highlighted by Perry et al. (2007), for instance. Consistently, most of the informal workers are female with on average more dependent children than formal workers.

[11] According to the productive definition on salaried workers, informality is around 21.7%, while considering all remunerative jobs it is approximately 33.2%.

Table 1: Descriptive Statistics

	Obs.	Mean	S.D.	Min	Max
Formal					
Male	17,757	0.81	0.39	0	1
Age	17,757	36.98	11.50	16	65
Married	17,757	0.69	0.46	0	1
Ed. Level	17,757	3.26	1.38	0	6
Head of Household	17,757	0.63	0.48	0	1
Adult-Eq. Income	17,757	445.08	479.34	3	11,000
Children Under 14	17,757	1.05	1.25	0	13
Informal					
Male	8,038	0.65	0.48	0	1
Age	8,038	32.23	12.36	15	65
Married	8,038	0.49	0.50	0	1
Ed. Level	8,038	2.95	1.25	0	6
Head of Household	8,038	0.38	0.49	0	1
Adult-Eq. Income	8,038	318.24	327.77	3	6,981
Children Under 14	8,038	1.24	1.49	0	13
Total					
Male	25,795	0.76	0.43	0	1
Age	25,795	35.40	12.01	15	65
Married	25,795	0.62	0.49	0	1
Ed. Level	25,795	3.16	1.35	0	6
Head of Household	25,795	0.55	0.50	0	1
Adult-Eq. Income	25,795	402.88	438.90	3	11,000
Children Under 14	25,795	1.11	1.34	0	13

Note: Using Legalistic definition of labor informality (only salaried workers) for the period 1997-2001. Averages are calculated considering the individual sampling weights. Male, married and head of household are indicator variables. Educational level is measured as maximum level of education achieved: 0 for no formal education to 6 for complete superior education. Children under 14 measures the number of children under 14 years of age. Source: Own calculations based on Encuesta Permanente de Hogares (EPH) data of Argentina.

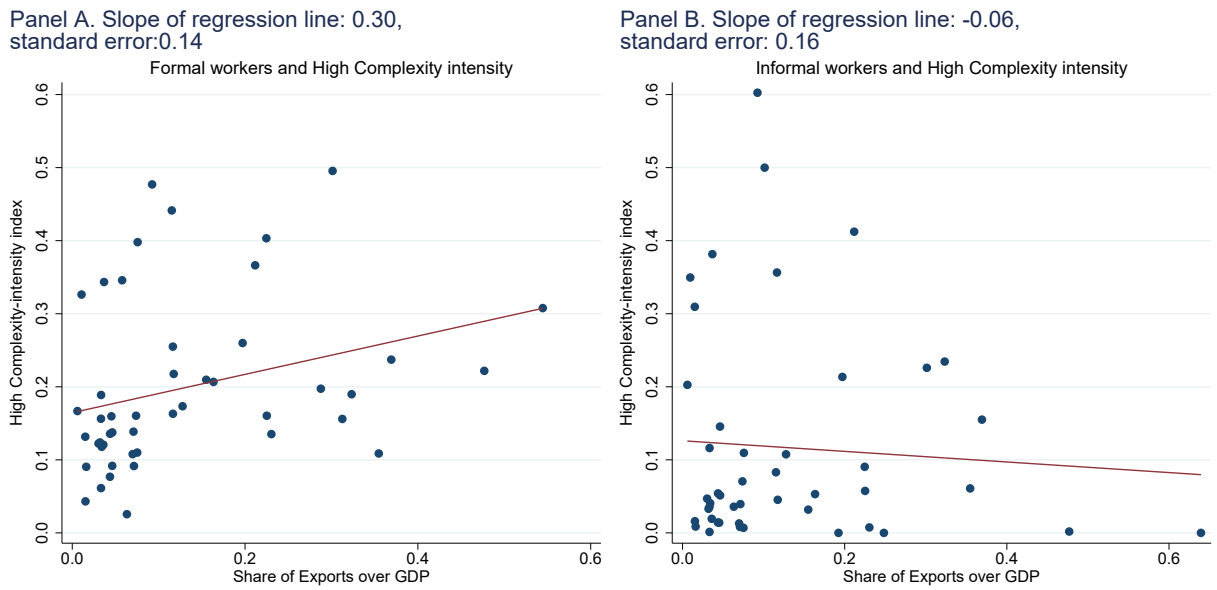
In addition, this survey provides a variable that classifies the task complexity of the main worker's occupation. The complexity is calculated based on typical characteristics of the work process and the actions delegated by this task. Thus, this variable reflects the characteristic of the job and not of the worker, classifying the complexity of the occupation and not the educational level of the workers. The task complexity measure is disaggregated in four categories, increasing in the level of complexity: low-skilled, operative, technical, and professional tasks. Based on this classification, I construct a measure of task complexity as a dummy variable that indicates whether the worker is performing a highly complex task. Accordingly, the individual's occupation task is highly complex if it is technical or professional, and lowly complex otherwise. I use this variable to determine how much of the

effect of exports on informality is explained by a change in the level of task complexity in workers' occupations.

Another relevant variable for the analysis is the export value, as a share of GDP, at the manufacturing industry level. This variable captures the export-intensity of the industries. The *Centro de Estudios para la Producción* (CEP), Ministry of Industry of Argentina, reports official data on the export share by manufacturing industry. While this information is measured by quarter, I recalculate it as an annual average measure. The disaggregation of this variable by industry is based on the ISIC (Revision 3) industrial classification, but with a lower level of disaggregation depending on the relevance of each sector to Argentinean economy.

The panels of Figure 3 plot the high complexity intensity of the task performed in the occupations by formal and informal workers in manufacturing industries as a function of the share of exports over GDP by industry on average over 1997-2001.

Figure 3: Average Task Complexity and Exports (across manufacturing industries) by Informality Status



Notes: Each observation corresponds to a manufacturing industry at 3-digits level of the International Standard Industrial Classification (ISIC), Rev. 3. High complexity-intensity index captures the share of workers performing technical or professional tasks in the manufacturing industry over 1997-2001. Labor informality status is computed based on the Legalistic definition on wage-earners. The solid line is the linear prediction for the High complexity-intensity index. Source: Own calculations based on Ministry of Industry, and Encuesta Permanente de Hogares (EPH) data of Argentina.

The figure shows that informal workers are more represented in occupations characterized by low complexity while formal workers are more commonly employed in occupations of high complexity. Moreover, informal workers are employed in industries with a lower share of exports compared to the formal ones. As we see from the panels, there is a positive significant correlation between the export intensity of manufacturing industries and the share of formal workers employed in high complexity tasks occupations, but this is not the case within informal employment.

Finally, I use a combination of two different data sources to construct the instrumental variable for exports: the weighted sum of the real income of the exports destinations' countries by industry-year. This variable captures the global demand shocks to Argentinean industries' exports. First, we need annual GDP data of all the countries of destination of manufacturing industries' exports. I obtain this data from the *World Development Indicators* (WDI) database. Second, this variable is weighted at industry level by the share of exports to each destination on the total exports of the industries in 1997. I use data from *UN Comtrade* to compute the share of each destination in the bundle of exports of each industry. In the next section I explain in detail how this instrumental variable is computed.

3 Estimates of the Impact of Export Intensity on Labor Informality

In this section I explore empirically how the export intensity of the industries affects the informal employment in the manufacturing sector. This allows to infer the degree of substitutability between formal and informal workers in the production and how the probability of working informally is affected by the share of exports on total production of the industry.

3.1 Empirical Model

I begin by studying the relationship between exports and labor informality, considering the following regression model for informality:

$$inf_{ijt} = \alpha EXP_{jt} + x'_{it}\beta_1 + \phi_a + \phi_j + \phi_t + \epsilon_{ijt} \tag{1}$$

where inf_{ijt} is a dummy variable that measures the informality status of individual i employed in the industry j at year t. In the right-hand side, the variable of interest is EXP_{jt}. It denotes the export intensity of the industry j, measured as the share of exports over its

gross value of production (i.e. $EXP_{jt} = (exports/GVP)_{jt}$), and its coefficient captures the effect of interest. I use this variable instead of simply the exports value, $exports_{jt}$, since EXP_{jt} reflects the relevance of the industry's exports on the total production value, capturing a higher variability across industries and years. The vector x'_{it} is a set of conditioning variables of individual characteristics such as gender, age, educational level, indicator variables for marital status, head of household, as well as household's characteristics such as household income (in equivalent-adult units), and number of children under 14 years of age. The regression model also includes agglomerate, 2-digits SIC industry level and year fixed effects, ϕ_a, ϕ_j and ϕ_t, respectively. The random component ϵ_{ijt} (the error term) captures the residual determinants of the informality status.

In this model, I include industry and agglomerate fixed effects to control for the unobserved industry and agglomerate characteristics that are time-invariant that could be correlated with exports and may have an independent effect on the informal employment of the individuals. Year fixed effects allows to account for aggregate shocks related to the business cycle or political economy changes associated to the labor market that are common to all the industries and individuals. As mentioned before, industry level variables are measured at the 3-digits SIC industry level. Thus, the sample includes 47 manufacturing industries and covers a period of 5 years (1997-2001).

As a benchmark, I first report in Table 2 the Pooled OLS estimates from equation (1) of the effect of the export share on the labor informality status, considering a Linear Probability Model. Standard errors are clustered at the 3-digits industry-year level. Note that these estimates are consistent if the export intensity is independent on the share of informal workers in the industry or depends on time-invariant characteristics of the industry that affect independently the informal share of labor force.

The empirical results show a negative and strongly significant effect of exports on labor informality. Accordingly, an increase in the export intensity of the manufacturing industry of 10 percentage points reduces the probability of working informally in the industry approximately by 3 percentage points. This result is robust to including the additional covariates detailed before, which control for worker's observable characteristics. Moreover, the conditional effects of the covariates have the expected signs, which is consistent with the descriptive statistics in Section 2.

Table 2: Pooled OLS Estimates of the Effects of Exports Intensity on Labor Informality

	Dependent variable: Informal Labor Indicator		
Specifications	(1)	(2)	(3)
Exports/GVP (%)	-0.0029***	-0.0019***	-0.0018***
	(0.001)	(0.001)	(0.001)
Male		-0.1305***	-0.1127***
		(0.021)	(0.021)
Age		-0.0485***	-0.0411***
		(0.003)	(0.003)
Age Sq.		0.0006***	0.0005***
		(0.000)	(0.000)
Married			-0.0540***
			(0.014)
Primary Incomplete			0.1353***
			(0.030)
Primary Complete			0.0884***
			(0.023)
Secondary Incomplete			0.0717***
			(0.022)
Secondary Complete			0.0049
			(0.020)
Higher Incomplete			0.0138
			(0.020)
Head of Household			-0.0693***
			(0.013)
Adult-Eq. Income			-0.0001***
			(0.000)
Children Under 14			0.0261***
			(0.004)
Constant	0.4951***	1.5588***	1.3753***
	(0.046)	(0.079)	(0.085)
Observations	25,793	25,793	25,793
R-squared	0.0897	0.1574	0.1850

*Notes: The table reports pooled OLS estimates from equation 1, calculated considering the individual sampling weights. Labor informality is based on the Legalistic definition (only salaried workers) for the period 1997-2001. Male, married and head of household are indicator variables. Children under 14 measures the number of children under 14 years of age. All regressions include agglomerate, industry and year fixed effects. Robust Standard Errors in parentheses, clustered at the 3-digits industry-year level. Significance level: *** p<0.01, ** p<0.05, * p<0.1.*

3.2 Identification Strategy

There are many reasons to think that exports may be endogenous in regression model (1). On the one hand, industries may choose the level of exports depending on the composition of the labor force. For instance, industries with a higher share of informal workers may be less

efficient and, consequently, to export less. At the same time, increasing the export intensity of the industries may imply a reduction in the informal share of workers to rise their average labor productivity, since formal workers are more skilled. On the other hand, workers sort across industries. Thus, individuals with higher probability of working formally may choose to work in industries with higher export intensity over production. This generates an omitted variable bias estimation problem given that there exist some unobservable characteristics of the workers that make them to choose working in 'more export intensive' industries and, at the same time, to have lower probability of being informal, that we cannot control for. In order to address this endogeneity issue, I use an instrumental variable strategy.

In order to construct a valid instrument, I exploit the exogenous variation of the Argentinean industries' exports that is driven by a demand shock that comes from the changes in the GDP of the importer countries. From Gravity Equations we know that the GDP of the trading partner is a relevant variable to determine the trade flows between two countries. It is possible to think that this variable satisfies the exclusion restriction, a condition necessary for its validity as an instrument. We can expect that the GDP of the countries that import Argentinean manufacturing products may not have any direct effect on the labor force composition of the exporter industry. Thus, the changes in the GDP of these countries may only affect Argentinean industries' informality rates through their direct effect on the exports.

Nevertheless, it is possible that some exogenous shocks to the GDP of the importer country affect simultaneously Argentina's GDP, or that both economies share some common trend. If this is the case, the exclusion restriction may fail to be valid.[12] To account for this potential concern on the validity of the instrument, I consider only the variation on the GDP' trend and cyclical components of the importer countries of Argentinean manufactures in 1997 (baseline period) that is orthogonal to the GDP of Argentina. In order to construct a measure of the GDP of the trading partners orthogonal to Argentina's GDP, I implement a simple econometric procedure to isolate the shock that consists in two steps:

Step 1: I estimate by OLS the following log-linear trend model for each country of destination of the Argentinean exports, c, separately,[13]

$$\ln GDP_t^c = \gamma_0^c + \gamma_1^c \mathrm{t} + \gamma_2^c \ln GDP_t^{Arg} + \nu_t^c \tag{2}$$

[12] In this case, a change in importer countries' GDP might have an effect not only on exports but also on the GDP that may affect Argentinean labor markets and the informal composition of its labor force.

[13] I only consider the countries that were importing the Argentinean manufacturing products in 1997.

where $\ln GDP_t^c$ is the natural logarithm of the real GDP of the country c at year t, t is a linear trend, and $\ln GDP_t^{Arg}$ is the natural logarithm of Argentina's real GDP. ν is the error term component. From this regression, I calculate the predicted trend of each country c as the sum of the estimated intercept, $\hat{\gamma_0}^c$, and $\hat{\gamma_1}^c$t. The predicted error, $\hat{\nu_t^c}$, gives us the GDP cyclical component orthogonal to Argentina's GDP.

Step 2: I compute the GDP of each country c orthogonal to Argentina's GDP for the period 1997-2001 as the sum of the predicted trend and cyclical components obtained in Step 1:

$$\ln \hat{GDP}_t^{c,*} = \hat{\gamma_0}^c + \hat{\gamma_1}^c t + \hat{\nu_t^c} \tag{3}$$

Considering the orthogonalized measure of the GDP of each country importing Argentinean manufactures computed following the two steps above, I construct the Exports Destinations' Real Income by industry (y_{jt}^*) instrumental variable for the exports intensity, EXP_{jt}, as:

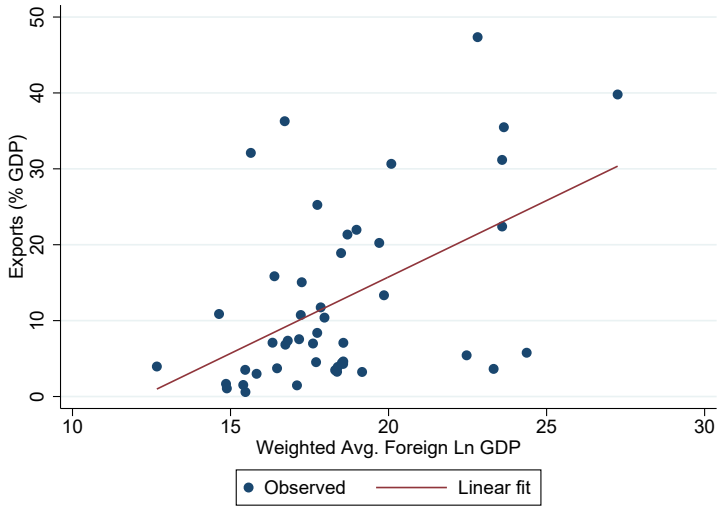
$$y_{jt}^* \equiv \sum_c \ln \hat{GDP}_t^{c,*} \times \psi_{j,97}^c \tag{4}$$

where $\ln \hat{GDP}_t^{c,*}$ is the predicted natural logarithm of the GDP of country c, other than Argentina, that is orthogonal to Argentina's GDP. The instrument is computed as a weighted sum, where the weight is given by $\psi_{j,97}^c$, the share of exports of industry j to each country on its total exports in 1997 (baseline period), i.e. $\psi_{j,97}^c \equiv \frac{expo_{j,97}^c}{expo_{j,97}}$. Thus, it also takes into account each industry exposure to a given economy, determined by the initial share on Argentinean exports of industry j, providing the source of variability across industries.[14]

The validity of this instrument relies on satisfying, in addition, a second condition: it must be relevant to explain variations in the export intensity, the instrumented variable. At difference from the exclusion restriction, this condition can be tested empirically. Figure 4 displays the relationship between the weighted sum of exports destination's GDP and the exports share for the manufacturing industries on average over the period 1997-2001. From this figure we observe a positive relationship between these two variables that seems to be strong. The correlation is 0.43 and statistically significant.

[14]By fixing the shares at the 1997 year level, this value is predetermined. Note that the variation of the instrumental variable will be given exclusively by the changes across industries on the GDP of the countries of destination of the exports.

Figure 4: Exports share on GDP and Weighted Average of Foreign GDP by manufacturing sector: 1997-2001



Notes: Manufacturing industries are at 3-digits ISIC level. Each observation represents the average value of the variables over the period 1997-2001.The weighted average foreign GDP variable is computed according to equation (4). Source: Own calculations based on Ministry of Industry of Argentina and WDI data.

However, the evidence provided in Figure 4 is not enough to assess the relevance of the instrument. Table 3 displays the results of the first stage estimation. The impact of the demand shock (i.e. the changes in destinations' real income) on export intensity is highly significant and has the expected sign. An increase in 1% of the weighted foreign GDP increases the export intensity by approximately 3.7 percentage points on average for the manufacturing industries, being statistically significant. Moreover, the F-statistic is larger than the minimum criteria for validity and are well above the critical value for the Stock and Yogo test (10% maximal IV size) of 16.38, reflecting that the measure of destinations' real income is a strong instrument. Results are robust to different specifications.

Table 3: First Stage: Estimates of the Effect of Exports' Destination countries GDP on Exports

	Dependent variable: Export Intensity (%)		
Specifications	(1)	(2)	(3)
Weighted Avg. GDP*	3.8682***	3.8602***	3.8597***
	(0.484)	(0.485)	(0.484)
Observations	25,793	25,793	25,793
F-statistic	63.91	63.48	63.76
R-squared	0.67	0.67	0.67
Additional covariates:	No	Yes	Yes
All covariates:	No	No	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Agglomerate FE	Yes	Yes	Yes

*Notes: The table reports the Pooled OLS estimates, calculated considering the individual sampling weights. Labor informality is based on the Legalistic definition (only salaried workers). All regressions include industry, year and agglomerate fixed effects. Additional covariates are male indicator, age and age squared. All covariates includes, in addition, marital status dummy, educational level, head of household indicator, adult-equivalent income and children under 14 indicator. Robust Standard Errors in parentheses, clustered at the 3-digits industry-year level. Significance level: *** p<0.01, ** p<0.05, * p<0.1.*

Using a Linear Probability Model and implementing an instrumental variable strategy, in the next subsection I identify the effect of exports on the probability of working informally in a manufacturing industry.

3.3 2SLS Estimates

Results of the estimated effects of the exports share on labor informality using 2SLS are reported in Table 4.[15] An increase in 10 percentage points in the export share reduces the probability of an individual working informally by approximately 2.2 percentage points. Considering that the average informality rate in the period is of 33 percent, this magnitude of the effect represents a reduction of 7% on the probability of having an informal job in the manufacturing sector. This result is highly significant and remain robust across different specifications when including some selected control variables. Also, the estimated coefficients of control variables have the expected sign, with informality decreasing with age, educational level, among others, and increasing with the number of children under 14 years old.[16]

[15] Alternatively, we can estimate the same model specifications by aggregating the data at sectoral 3 digits level. Nevertheless, we do not find any gains from doing so since we will lose precision in our estimation through the aggregation.

[16] Results of the regression estimation with all the coefficient estimates are in the Appendix.

Table 4: 2SLS Estimates of the Effects of Exports on Labor Informality

	Dependent variable: Informal Labor Indicator		
Specifications	(1)	(2)	(3)
Exports/GPV (%)	-0.0037***	-0.0022***	-0.0022***
	(0.001)	(0.001)	(0.001)
Observations	25,793	25,793	25,793
R-squared	0.090	0.157	0.185
Additional covariates:	No	Yes	Yes
All covariates:	No	No	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Agglomerate FE	Yes	Yes	Yes

*Notes: The table reports 2SLS estimates from equation 1, calculated considering the individual sampling weights. Labor informality is based on Legalistic definition (only salaried workers). All regressions include industry, year and agglomerate fixed effects. Additional covariates are male indicator, age and age squared. All covariates includes, in addition, marital status dummy, educational level, head of household indicator, adult-equivalent income and children under 14 indicator. Robust Standard Errors in parentheses, clustered at the 3-digits industry-year level. Significance level: *** p<0.01, ** p<0.05, * p<0.1.*

If we compare the estimation results in Table 4 with the Pooled OLS estimates, the estimated coefficients for the effect of exports intensity are similar. This evidence provides the intuition that, in fact, the potential endogeneity issues highlighted in Section 3.2 seem not to be a problem here.

The results show the relevance of the exports intensity to determine the informality rate within the industries. To provide a better understanding of the mechanisms of this effect, in the next section, I explore the channel through which exports affect the informality.

4 Exploring the Mechanisms

Given the empirical evidence on the relevance of exports to explain the share of informal workers in the labor force provided in Section 3, I proceed to analyze the potential mechanisms behind this effect. To this end, I look at two aspects of the phenomenon.

First, I study the impact of the exports on the informality rate by differentiating the effect depending on the income level of the country of destination of the exports. There is evidence that exporting to high-income countries increases firms' productivity and requires higher skills compared to exporting to other destinations. If the productivity channel partially explains the effect on the informality rate, exporting to high- or low-income countries should have a similar differential effect on the share of informal workers in an industry. Second, a rise in firm's productivity may also be associated to increases in the complexity of the task

performed in the jobs. Thus, I explore the effects of exports on the informality rate that only comes through changes in the average complexity of the tasks.

4.1 Distinguishing between Income Group of Destination Country

Exports growth may require an increase in productivity that may generate a drop in the informal composition of the labor force at an industry. Marin (1992), De Loecker (2007), Park et al. (2010), and Brambilla, Lederman and Porto (2012), among others, show that only the exports to high-income countries increase firm's productivity and the average skills requirements.[17] Considering these effects, if increasing productivity drives the reduction of the informal composition of the labor force, I should find evidence on two facts. First, increasing exports to high-income destinations should reduce informality. Second, for low-income countries this effect should not be observed.

Distinguishing between exports to high- and low-income destination countries, I explore the effects of exports intensity on the probability of working informally in manufacturing industries. Thus, I estimate the regression model for informality below, that is an adaptation of model (1):

$$inf_{ijt} = \alpha_1 EXP_{jt}^{LI} + \alpha_2 EXP_{jt}^{HI} + x'_{it}\beta_1 + \phi_a + \phi_j + \phi_t + \epsilon_{ijt} \tag{5}$$

where, EXP_{jt}^{LI} denotes the export intensity of the industry j measured as the share of exports to low-income countries (LI) over its gross value of production (i.e. $EXP_{jt}^{LI} = (expLI/GVP)_{jt}$) and, analogously, for high-income export intensity, EXP_{jt}^{HI}.[18] ϵ_{ijt} is the disturbance term, and the vector of individual characteristics, x'_{it} contains the same covariates previously used.

Given the potential endogeneity concerns in the estimation of equation (5), I follow an instrumental variable strategy to estimate the effect of the export variables on informality rate in the manufacturing industries. Similarly to the Destination countries' GDP instrument used in the previous section, I now split it as a weighted average of the natural logarithm of high- and low-income destinations' GDP, such that $y_{jt}^{IG,*} \equiv \sum_{c \in IG} \ln \hat{GDP}_t^{c,*} \times \psi_{j,97}^{c}$, with

[17] Note that I obtain results consistent with this literature by estimating by 2SLS the effect of exporting to high- and low-income destinations on the natural logarithm of the hourly wage. The second stage estimation results can be found in the Appendix.

[18] Income Groups are classified according to World Bank Analytical classification: High Income Group (High and Upper Middle Income countries) and Low Income Group (Low and Lower Middle Income countries), that is calculated based on the GNI per capita in US$ (Atlas Methodology).

$IG = \{HI, LI\}$. Estimated results on informal labor indicator are in Table 5.[19]

Table 5: 2SLS Estimates of the Effects of Exports Intensity by Income Group on Labor Informality

	Dependent variable: Informal Labor Indicator		
Specifications	(1)	(2)	(3)
ExpoLI/GPV (%)	0.0116*	0.0073	0.0046
	(0.007)	(0.006)	(0.005)
ExpoHI/GPV (%)	-0.0092***	-0.0054**	-0.0045**
	(0.003)	(0.002)	(0.002)
First Stages:			
F-Statistic HI	23.93	23.62	23.75
F-Statistic LI	22.95	23.02	23.04
Observations	25,793	25,793	25,793
R-squared	0.086	0.156	0.184
Additional covariates:	No	Yes	Yes
All covariates:	No	No	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Agglom. FE	Yes	Yes	Yes

*Notes: The table reports 2SLS estimates from equation 5, calculated considering the individual sampling weights. Labor informality is based on Legalistic definition (only salaried workers). All regressions include industry, year and agglomerate fixed effects. Additional covariates are male indicator, age and age squared. All covariates includes, in addition, marital status dummy, educational level, head of household indicator, adult-equivalent income and children under 14 indicator. Robust Standard Errors in parentheses, clustered at the 3-digits industry-year level. Significance level: *** p<0.01, ** p<0.05, * p<0.1.*

We observe that, when exports are to high-income countries, the negative effect of exports on labor informality is much higher than without differentiating by the income group of the destination of the exports. When the export intensity to high-income destinations increases in 10 percentage points, the probability of working informally in the manufacturing industries decreases by around 5 percentage points. In the case of the exports to low-income destinations, the effect has the opposite sign, but it is not significant. A possible explanation to this effect may be that the lower quality requirements in the manufacturing products imported by these countries may generate more competition in terms of prices. Therefore, in order to reduce costs, industries may increase the informal composition of the labor force. To sum up, only increasing exports to high-income countries reduces the share of informal workers in the manufacturing industries. This evidence is consistent with the idea that the

[19]First stage estimation results are in Appendix. The impact of the demand shocks (destinations' real incomes) on export intensity is highly significant and has the expected sign for high- and low-income instruments. The F-statistics are larger than the minimum criteria for validity and are well above the critical value for the Stock and Yogo test (10% maximal IV size), reflecting that the two measures of destinations' real income are strong instruments. Results are robust to different specifications.

reduction in informality rates comes from the increase in the productivity of the industry driven by an increase in exports.

4.2 Task complexity

In previous sections I have showed that export intensity has a negative effect on labor informality, which is partially explained by the variations on productivity of the industries generated by the changes in the export intensity. A possible way of increasing productivity may be via an increase in the complexity of the tasks performed in the jobs. In this section, I provide empirical evidence of the effect of the export intensity on informality rate that comes through changes in the task's complexity of the jobs.

To estimate the effect of exports on manufacturing industry share of informal workers that is associated to changes in the task complexity of the jobs, consider the regression model below:

$$EXP_{jt} = \beta_1^1 y_{jt}^* + \beta_2^1 x'_{ijt} + \phi_a + \phi_j + \phi_t + \eta_{jt}^1 \tag{6}$$

$$HCT_{ijt} = \beta_1^2 E\hat{X}P_{jt} + \beta_2^2 x'_{ijt} + \phi_a + \phi_j + \phi_t + \eta_{jt}^2 \tag{7}$$

$$Inf_{ijt} = \beta_1^3 H\hat{C}T_{ijt} + \beta_2^3 x'_{ijt} + \phi_a + \phi_j + \phi_t + \eta_{jt}^3 \tag{8}$$

where y_{jt}^* the Destination countries' real GDP instrumental variable, HCT_{ijt} is a dummy variable that indicates whether the task performed in the job by worker i employed in industry j at year t is of high complexity.[20] The model also includes agglomerate, 2-digits SIC industry level and year fixed effects, ϕ_a, ϕ_j and ϕ_t, respectively. η_{ijt} are the random error components.

I estimate the regression model by 3SLS. Results of second (equation (7)) and third (equation (8)) stages are in Table 6. The negative effect that the export intensity of the industries has on the informality rate is partially explained by an increase in the complexity of the tasks performed in the jobs. We observe from the estimation results that an increase in the export intensity of the manufacturing industries in 10 percentage points reduces the share of informal workers in 1.8 percentage points, on average. Hence, around 80% of the effect of exports on the informality rate is explained by the changes in the complexity of the tasks performed by the workers.

[20] A task is of high-complexity if it is technical or professional, according to the definitions in the Appendix.

Table 6: 3SLS Estimates of the Effects of Exports Intensity on Labor Informality

	High-Task's Complexity *(Second Stage)*			Informal Labor Indicator *(Third Stage)*		
Specifications	(1)	(2)	(3)	(4)	(5)	(6)
Exports/GPV (%)	0.0017***	0.0014***	0.0014***			
	(0.001)	(0.001)	(0.000)			
Tasks High-Complexity				-1.648***	-1.393***	-1.244***
				(0.348)	(0.421)	(0.393)
Observations	25,758	25,758	25,758	25,758	25,758	25,758
F-statistic	27.50	30.05	74.14	39.84	91.40	93.62
R-squared				0.09	0.16	0.18
Additional covariates:	No	Yes	Yes	No	Yes	Yes
All covariates:	No	No	Yes	No	No	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Agglomerate FE	Yes	Yes	Yes	Yes	Yes	Yes

*Notes: The table reports 3SLS estimates from equations (6)-(8), calculated considering the individual sampling weights. Labor informality is based on Legalistic definition (only salaried workers). All regressions include industry, year and agglomerate fixed effects. Additional covariates are male indicator, age and age squared. All covariates includes, in addition, marital status dummy, educational level, head of household indicator, adult-equivalent income and children under 14 indicator. Robust Standard Errors in parentheses, clustered at the 3-digits industry-year level. Significance level: *** p<0.01, ** p<0.05, * p<0.1.*

5 Conclusions

Exports may have significant effects in local labor markets and, in particular, in the share of informal workers in an industry. Using data from Argentinean workers in the manufacturing industries from 1997 to 2001, I have analysed the reaction of the labor market in terms of informality as a respond to demand shocks to exports.

I have found empirical evidence that exports intensity affects the probability of working informally in the manufacturing industries. While price competition may induce to hire informal workers to reduce costs, higher quality requirements in exports may require to hire more formal workers, that are more skilled, and to induce an increase in the productivity of the industries. I have shown that exports intensity reduces labor informality and that the net effect is explained by exporting to high-income countries. Exporting to high-income destinations increases firm's productivity and average skill requirements in production, which may explain the increase in the formal share of the labor force. I have provided also evidence that this effect is highly explained by an increase in task complexity of the jobs, which might indicate changes in the productivity of the industries.

To conclude, the empirical evidence suggests that export intensity is an important determinant on informality. Nevertheless, not all kind of exports are equally relevant to reduce informal employment. This is an important factor that should be considered when designing policies in order to increase exports or to contribute to the reduction of informality.

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Appendix

A *Encuesta Permanente de Hogares* (EPH)

The *Encuesta Permanente de Hogares* (EPH - Permanent Household Survey) is the main household and labor force micro-level survey in Argentina, carried on by the *Instituto Nacional de Estadistica y Censos* (INDEC). The EPH includes an specific survey on labor market variables according to international standards. It covers great urban agglomerates (more than 100,000 inhabitants) and has an approximate coverage of more than 70% of urban population. Since the share of urban areas in Argentina is around 87%, the sample of the EPH represents approximately 62% of total population of the country. Note that since the survey considers only urban areas, it has a low coverage of employment in agricultural sector. The survey is conducted twice a year (May and October) with a 25% rotation of the panel. During 2003 a major methodological change was implemented, including changes in the questionnaires and the frequency of the survey visits.

The EPH gathers information on individual socio-demographic characteristics, employment status, hours of work, wages, income, type of job, education, and migration status. It includes the following main labour related characteristics: employment, unemployment, underemployment, hours of work, wages, employment related benefits, informal employment, social security coverage, absence from work, as well as other labour related characteristics such as industry, occupation, status in employment, institutional sector (public/private), size of establishment, full time/part time status, permanency of the job, type of workplace, duration of employment, existence of more than one job, duration of unemployment, previous working experience, characteristics of the last job, search for another job, receipt of unemployment benefits, reasons for not being in the labour force. In particular, wage-earners are asked to self-declare if they count with different social security benefits (such as retirement pension, health insurance, paid vacations, indemnification, among others). The specific question used to identify the informality status is: 'In your main occupation, do you have the right to receive a pension when retired?'. If she does, we classify the individual as working formally; otherwise, informally. Nevertheless, this survey does not provide information on the compliance of tributary and social security norms of self-employees.

The labor force survey is considered official for employment and unemployment. Thus, this survey is particularly useful for the analysis given that not only includes individual and firm level variables that allows to classify the individuals as working in a formal/informal job,

but also provides information on the sector of employment of the individuals. Worker activity's sector is registered following the *International Standard Industrial Classification*(ISIC), Revision 3, at the level of aggregation of 3 digits. We focus on the manufacturing sector that accounts for more than 70% (on average) of total exports for the period 1997-2001.

Task Complexity Classification

The EPH includes the question 'what is the name of your occupation and which task is performed in this occupation?' (variable P20). A new variable is constructed, based on this question, that classifies the task of the worker according to the *Clasificador Nacional de Ocupaciones INDEC* (National Classification of Occupations, CNO'91). Thus, we are not able to reconstruct any other measure of task complexity based on this classification since it does not provide the information regarding the occupation and task of the individual. This variable is conformed by three digits, considering the following dimensions of the occupational structure: general character, complexity, technology and hierarchy within the labor process.

I only consider the complexity of the task, that consists on an objective characteristic of the work process that measures the complexity of the action delegated by it. This task complexity measure is disaggregated in 4 categories:

- *Low-skilled Tasks:* includes those occupations in which the task performed are of low diversity, using simple objects and instruments or, in many cases, the own body of the worker. These occupations do not require previous abilities or knowledge for their execution, except for some brief instructions at the beginning.

- *Operative Tasks:* are those in which the tasks involves certain frequency and variety that require attention, speed and manipulative skills as well as some specific knowledge of the properties of the objects and instruments used. These occupations require specific knowledge and abilities acquired by previous training and/or work experience.

- *Technical Tasks:* comprises those occupation in which, in general, the worker performs multiple and diverse tasks with a changing sequence, that require at the same time manipulative skills and theoretical specific knowledge on the properties and characteristics of the objects and instruments used at work and the specific rules of the involved processes. These occupations require specific knowledge and abilities acquired by previous formal training and/or equivalent work experience.

- *Professional Tasks:* are those in which the worker performs multiple and diverse tasks with a changing sequence, that require general and specific theoretical knowledge on the properties and characteristics of the objects and instruments used at work, and of the rules and laws that regulate the processes. These occupations require knowledge acquired by specific formal training and equivalent work experience.

B Complementary Analysis

Table 7: Description of Manufacturing Industries

Industry	**Description**	**% of Manufacturing GDP**	**% of Manufacturing Exports**	**Informality Rate**
151	*Food (including meat, fish, fruits, pulses, vegetables, oils and fats)*	12.61	29.21	30.88
152	*Manufacture of Dairy Products*	3.35	1.96	23.62
153	*Milling of wheat, pulses and cereals. Preparation of rice, animal food and starch*	1.75	2.35	21.21
154	*Bakery products, sugar, chocolate, fresh and dried pasta, coffee, tea, mat and spices*	5.73	2.27	35.73
155	*Manufacture of soft drinks, wine, beer, mineral water, fruit juices and spirits*	4.32	1.78	24.69
160	*Preparation of tobacco sheets, cigarettes and loose tobacco for pipes*	2.13	0.16	2.89
171	*Manufacture of yarn and fabrics, finishing of textiles*	2.03	1.06	20.48
172	*Manufacture of bedding, towels, linens and carpets, ropes and nets*	0.95	0.47	51.50
173	*Manufacture of knitted and crocheted items*	0.69	0.12	46.51
18A	*Manufacture of garments and leather goods*	2.54	0.73	59.32
191	*Tanning and leather finishing and manufacture of saddlery and leather goods*	1.45	5.72	37.17
192	*Manufacture of footwear and parts*	1.10	0.39	51.76
20A	*Manufacture of wood and its products (except for furniture), cork and straw goods*	1.98	0.46	55.31
210	*Manufacture of paper and paper products*	2.80	1.63	12.97

Table 7 – *Continued from previous page*

Industry	**Description**	**% of Manufacturing GDP**	**% of Manufacturing Exports**	**Informality Rate**
221	*Edition of booklets, books, newspapers and production of records, CDs, etc.*	2.01	0.64	33.19
222	*Printing and related services*	2.11	0.08	40.37
23A	*Manufacture of coke (fuel) ovens*	0.04	0.03	0.00
232	*Production of liquid and gaseous fuels, and lubricant greases*	8.71	5.02	3.49
241	*Manufacture of basic chemicals, except fertilizers*	2.73	6.27	5.72
242	*Manufacture of chemicals*	7.70	4.12	33.96
243	*Manufacture of man-made fibers (artificial and synthetic)*	0.30	0.59	0.00
251	*Rubber products*	0.79	0.71	34.61
252	*Manufacture of plastic products*	3.94	0.96	31.43
261	*Manufacture of glass and glass products*	0.38	0.28	6.83
269	*Manufacture of nonmetallic mineral products*	2.01	0.51	32.82
271	*Iron and steel products*	3.10	5.94	21.99
272	*Products of nonferrous metals*	0.79	1.72	0.00
281	*Manufacture of metal products for structural uses, tanks, reservoirs and steam generators*	0.86	0.24	37.88
289	*Process of finishing metal surfaces*	2.46	0.82	31.30
291	*Manufacture of general purpose machinery*	1.68	2.28	22.35
292	*Manufacture of special purpose machinery*	1.41	0.86	6.11
293	*Manufacture of stoves, water heaters, electrical appliances and other household goods*	0.95	0.10	12.21
300	*Manufacture of office, accounting and computing machinery*	0.10	0.19	10.78
31A	*Manufacture of motors; electrical generators and transformers; and electricity control and distribution devices*	0.52	0.48	13.35

Table 7 – *Continued from previous page*

Industry	Description	% of Manufacturing GDP	% of Manufacturing Exports	Informality Rate
31B	*Manufacture of accumulators, batteries, electric lamps and lighting equipment*	0.52	0.52	27.88
313	*Manufacture of insulated wire and cables*	0.32	0.16	1.33
32A	*Manufacture of tubes, valves and other electronic components; radio and TV transmitters and telephone apparatus*	0.31	0.17	75.09
323	*Manufacture of TV and radio receivers, video & sound players and recorders*	0.64	0.17	32.85
33A	*Medical, optical and precision instruments, watches*	0.32	0.45	36.10
341	*Manufacture of motor vehicles*	4.44	13.51	6.33
342	*Manufacture of bodieswork for motor vehicles, trailers and semitrailers*	0.63	0.05	18.07
343	*Manufacture of parts and accessories for motor vehicles and their engines*	2.13	2.87	16.67
35A	*Manufacture of locomotives and rolling stock for railways and trams, and aircraft manufacturing*	0.26	0.21	1.59
351	*Building and repairing of ships and boats*	0.15	0.40	6.91
359	*Manufacture of motorcycles, bicycles, wheelchairs and braces*	0.16	0.03	65.36
361	*Manufacture of furniture, beds and mattresses*	2.16	0.62	61.24
369	*Jewelery, musical instruments, sporting goods, toys and games, and other manufacturing industries*	0.62	0.20	59.97
	Total	**100.00**	**100.00**	**33.14**

Note: Shares computed with 1998 data. Informality is defined using the legalistic definition.

Source: Ministry of Industry and own calculations based on EPH data.

C Estimated results considering the legalistic definition of informal labor force.

Table 8: First Stage: Estimates of the Effect of Exports' Destination countries GDP on Exports

	Dependent variable: Export Intensity (%)		
Specifications	(1)	(2)	(3)
Weighted Avg. GDP*	3.8682***	3.8602***	3.8597***
	(0.484)	(0.485)	(0.484)
Male		0.0560	0.0517
		(0.190)	(0.204)
Age		0.0697**	0.0661*
		(0.035)	(0.038)
Age Sq.		-0.0007*	-0.0007
		(0.000)	(0.000)
Married			-0.2984*
			(0.157)
Primary Incomplete			-0.3650
			(0.417)
Primary Complete			-1.0363***
			(0.375)
Secondary Incomplete			-0.8051**
			(0.391)
Secondary Complete			-0.5483
			(0.400)
Higher Incomplete			0.0121
			(0.352)
Head of Household			0.3245*
			(0.167)
Adult-Eq. Income			0.0000
			(0.000)
Children Under 14			0.0160
			(0.038)
Constant	-81.040***	-82.293***	-81.539***
	(11.988)	(11.874)	(11.856)
Observations	25,793	25,793	25,793
F-statistic	63.91	63.48	63.76
R-squared	0.67	0.67	0.67
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Agglomerate FE	Yes	Yes	Yes

*Notes: The table reports the Pooled OLS estimates, calculated considering the individual sampling weights. Labor informality is based on the Legalistic definition (only salaried workers). All regressions include industry, year and agglomerate fixed effects. Male, married and head of household are indicator variables. Children under 14 measures the number of children under 14 years of age. Robust Standard Errors in parentheses, clustered at the 3-digits industry-year level. Significance level: *** p<0.01, ** p<0.05, * p<0.1.*

Table 9: Pooled OLS and 2SLS Estimates of the Effects of Exports on Labor Informality

	Dependent variable: Informal Labor Indicator					
	Pooled OLS			2SLS		
Specifications	(1)	(2)	(3)	(4)	(5)	(6)
Exports/GVP (%)	-0.0029***	-0.0019***	-0.0018***	-0.0037***	-0.0022***	-0.0022***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Male		-0.1305***	-0.1127***		-0.1303***	-0.1124***
		(0.021)	(0.021)		(0.021)	(0.021)
Age		-0.0485***	-0.0411***		-0.0485***	-0.0410***
		(0.003)	(0.003)		(0.003)	(0.003)
Age Sq.		0.0006***	0.0005***		0.0006***	0.0005***
		(0.000)	(0.000)		(0.000)	(0.000)
Married			-0.0540***			-0.0540***
			(0.014)			(0.014)
Primary Incomplete			0.1353***			0.1357***
			(0.030)			(0.030)
Primary Complete			0.0884***			0.0880***
			(0.023)			(0.023)
Secondary Incomplete			0.0717***			0.0713***
			(0.022)			(0.022)
Secondary Complete			0.0049			0.0046
			(0.020)			(0.020)
Higher Incomplete			0.0138			0.0136
			(0.020)			(0.020)
Head of Household			-0.0693***			-0.0691***
			(0.013)			(0.013)
Adult-Eq. Income			-0.0001***			-0.0001***
			(0.000)			(0.000)
Children Under 14			0.0261***			0.0261***
			(0.004)			(0.004)
Constant	0.4951***	1.5588***	1.3753***	0.5683***	1.5851***	1.3860***
	(0.046)	(0.079)	(0.085)	(0.046)	(0.080)	(0.085)
Observations	25,793	25,793	25,793	25,793	25,793	25,793
R-squared	0.0897	0.1574	0.1850	0.0895	0.1573	0.1849
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Agglomerate FE	Yes	Yes	Yes	Yes	Yes	Yes

*Notes: The table reports Pooled OLS and 2SLS estimates from equation 1, calculated considering the individual sampling weigths. Labor informality is based on the Legalistic definition (only salaried workers). Male, married and head of household are indicator variables. Children under 14 measures the number of children under 14 years of age. All regressions include agglomerate, industry and year fixed effects. Robust Standard Errors in parentheses, clustered at the 3-digits industry-year level. Significance level: *** p<0.01, ** p<0.05, * p<0.1.*

Table 10: First Stage: Estimates of the Effect of Exports' Destination countries GDP on Exports by Income Group

	Dependent variables:					
	Export Intensity LI (%)			Export Intensity HI (%)		
Specifications	(1)	(2)	(3)	(4)	(5)	(6)
Weighted Avg. GDP* LI	0.4324***	0.4320***	0.4316***	0.4780**	0.4780**	0.4898**
	(0.072)	(0.072)	(0.072)	(0.234)	(0.234)	(0.233)
Weighted Avg. GDP* HI	0.5167***	0.5159***	0.5160***	2.3603***	2.3488***	2.3453***
	(0.109)	(0.109)	(0.109)	(0.384)	(0.384)	(0.383)
Male		-0.0760	-0.0863		0.2508*	0.2588*
		(0.052)	(0.056)		(0.148)	(0.156)
Age		0.0194**	0.0189*		0.0726**	0.0663**
		(0.009)	(0.010)		(0.030)	(0.032)
Age Sq.		-0.0002*	-0.0002		-0.0008**	-0.0007*
		(0.000)	(0.000)		(0.000)	(0.000)
Married			-0.0725*			-0.1853
			(0.043)			(0.133)
Primary Incomplete			0.0497			-0.3915
			(0.095)			(0.365)
Primary Complete			-0.0728			-0.9745***
			(0.077)			(0.335)
Secondary Incomplete			-0.0562			-0.8128**
			(0.083)			(0.347)
Secondary Complete			-0.0077			-0.5992*
			(0.084)			(0.350)
Higher Incomplete			0.0083			0.0007
			(0.082)			(0.320)
Head of Household			0.0571*			0.2576*
			(0.034)			(0.134)
Adult-Eq. Income			-0.0000			0.0001
			(0.000)			(0.000)
Children Under 14			0.0193			-0.0042
			(0.013)			(0.035)
Constant	-17.982***	-18.299***	-18.259***	-55.258***	-56.599***	-57.772***
	(3.101)	(3.116)	(3.115)	(9.408)	(9.318)	(9.239)
Observations	25,793	25,793	25,793	25,793	25,793	25,793
F-Statistic	22.95	23.02	23.04	23.93	23.62	23.75
R-Squared	0.6732	0.6737	0.6741	0.6362	0.6366	0.6380
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Agglomerate FE	Yes	Yes	Yes	Yes	Yes	Yes

*Notes: The table reports the Pooled OLS estimates on Export Intensity to high- and low-income destinations, calculated considering the individual sampling weights. Labor informality is based on the Legalistic definition (only salaried workers). All regressions include industry, year and agglomerate fixed effects. Male, married and head of household are indicator variables. Children under 14 measures the number of children under 14 years of age. Robust Standard Errors in parentheses, clustered at the 3-digits industry-year level. Significance level: *** p<0.01, ** p<0.05, * p<0.1.*

Table 11: Second Stage: Estimates of the Effect of Exports on Labor Informality by Income Group

	Dependent variable: Informal Labor Indicator		
Specifications	(1)	(2)	(3)
ExpoLI/GPV (%)	0.0116*	0.0073	0.0046
	(0.007)	(0.006)	(0.005)
ExpoHI/GPV (%)	-0.0092***	-0.0054**	-0.0045*
	(0.003)	(0.002)	(0.002)
Male		-0.1284***	-0.1108***
		(0.021)	(0.021)
Age		-0.0483***	-0.0409***
		(0.003)	(0.003)
Age Sq.		0.0006***	0.0005***
		(0.000)	(0.000)
Married			-0.0540***
			(0.014)
Primary Incomplete			0.1331***
			(0.030)
Primary Complete			0.0859***
			(0.023)
Secondary Incomplete			0.0693***
			(0.022)
Secondary Complete			0.0029
			(0.020)
Higher Incomplete			0.0137
			(0.020)
Head of Household			-0.0692***
			(0.013)
Adult-Eq. Income			-0.0001***
			(0.000)
Children Under 14			0.0259***
			(0.004)
Constant	0.593***	1.596***	1.3954***
	(0.045)	(0.080)	(0.084)
Observations	25,793	25,793	25,793
R-squared	0.086	0.156	0.184
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Agglomerate FE	Yes	Yes	Yes

*Notes: The table reports the Pooled OLS estimates on Export Intensity to high- and low-income destinations, calculated considering the individual sampling weights. Labor informality is based on the Legalistic definition (only salaried workers). All regressions include industry, year and agglomerate fixed effects. Male, married and head of household are indicator variables. Children under 14 measures the number of children under 14 years of age. Robust Standard Errors in parentheses, clustered at the 3-digits industry-year level. Significance level: *** p<0.01, ** p<0.05, * p<0.1.*

D Second Stage Results of the Effects of Exports Intensity by Income Group on Hourly Wages

Table 12: 2SLS Estimates of the Effects of Exports Intensity by Income Group on Hourly Wages

	Dependent variable: Hourly Wage (ln)		
Specifications	(1)	(2)	(3)
ExpoLI/GPV (%)	-0.038***	-0.033***	-0.017**
	(0.011)	(0.009)	(0.007)
ExpoHI/GPV (%)	0.022***	0.016***	0.011***
	(0.004)	(0.004)	(0.003)
Observations	24,081	24,081	24,081
R-squared	0.167	0.256	0.517
Additional covariates:	No	Yes	Yes
All covariates:	No	No	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Agglom. FE	Yes	Yes	Yes

Notes: The table reports 2SLS estimates from wage equation $\ln wage_{ijt} = \theta_1 EXP_{jt}^{LI} + \theta_2 EXP_{jt}^{HI} + x'_{it}\theta_3 + \phi_a + \phi_j + \phi_t + \omega_{ijt}$*, calculated considering the individual sampling weights.* $\ln wage_{ijt}$ *is the natural logarithm of the hourly wage on worker's main occupation, which is a measure of labor productivity of individual* i *in the industry* j *at year* t*.* ω_{ist} *is the error term. All regressions include industry, year and agglomerate fixed effects. Additional covariates are male indicator, age and age squared. All covariates includes, in addition, marital status dummy, educational level, head of household indicator, adult-equivalent income and children under 14 indicator. Robust Standard Errors in parentheses, clustered at the 3-digits industry-year level. Significance level: *** p<0.01, ** p<0.05, * p<0.1.*