WIAS Discussion Paper No.2017-001

DO EXPORTS LEAD TO MORE WOMEN EMPOWERMENT? SOME INSIGHTS FROM THE GENDER SPECIFIC EFFECTS OF EXPORTS ON LABOR FORCE PARTICIPATION IN INDONESIA

May 18, 2017

Tatyana CHESNOKOVA
Waseda Institute for Advanced Study, Waseda University

Jesmin RUPA
Centre for Global Food and Resources, University of Adelaide

Nicholas SIM
School of Economics, University of Adelaide

WIAS 早稲田大学高等研究所 Waseda Institute for Advanced Study

1-6-1 Nishiwaseda, Shinjuku-ku, Tokyo 169-8050, Japan
Tel: 03-5286-2460 ; Fax: 03-5286-2470

DO EXPORTS LEAD TO MORE WOMEN EMPOWERMENT? SOME INSIGHTS FROM THE GENDER SPECIFIC EFFECTS OF EXPORTS ON LABOR FORCE PARTICIPATION IN INDONESIA*†

Tatyana Chesnokova
Waseda Institute of Advanced Study
Waseda University

Jesmin Rupa
Centre for Global Food and Resources
University of Adelaide

Nicholas Sim
School of Economics
University of Adelaide

April 2017

*We thank the participants at the PRIMCED 2015 workshop at Hitotsubashi University, and the seminar participants at the University of Queensland, Waseda University Institute of Developing Economies, and Australian National University Crawford School of Public Policy seminars and the 45th Australian Conference for Economists for their helpful comments.

†*Tatyana Chesnokova*: Associate Professor, WIAS, Waseda University, -6-1 Nishi Waseda, Shinjuku-ku, Tokyo 169-8050, Japan. Email: chesnokova.tatyana@gmail.com; *Jesmin Rupa*: PhD. Candidate, Centre for Global Food and Resources, University of Adelaide, Adelaide SA 5005, Australia. Email: jesmin.rupa@adelaide.edu.au; *Nicholas Sim*: Senior Lecturer, School of Economics, University of Adelaide, Adelaide SA 5005, Australia. Email: nicholas.sim@adelaide.edu.au.

DO EXPORTS LEAD TO MORE WOMEN EMPOWERMENT? SOME INSIGHTS FROM THE GENDER SPECIFIC EFFECTS OF EXPORTS ON LABOR FORCE PARTICIPATION IN INDONESIA

Abstract

Do exports lead to more women empowerment? To address this question, we conduct a panel study on the gender specific effects that exports might have on labor force participation using micro-level data from the Indonesian Family Life Survey. We construct an export exposure index, which combines information about exports and the individual's location, such that from our panel estimates of its impact on the individual's labor participation, we may recover the effect of exports purged of unobserved household heterogeneity and macroeconomic shocks. We find that exports encourage women to reduce labor participation for housework but have no statistically significant effect on men. Hence, insofar empowerment is associated with employment, exports may not lead to more empowerment of women relative to men. We construct a simple model to show that if women have a comparative disadvantage in market work relative to men, and if an increase in exports increases the gender wage gap, women's labor participation would be negatively related to exports as observed.

Keywords: Exports, Gender, Labor Force Participation, Women Empowerment.
JEL classifications: O12, F63.

1 Introduction

The empowerment of women and the improvement of their economic and social standing are among the major goals of the United Nations.[1] Women's empowerment is often taken to be the increase in their economic freedom, self-determination, and influence over family decisions such as education, nutrition and health (Schultz, 2002). However, in some developing countries, the problem of gender inequality can be perpetuated by parents having lower aspirations for their daughters than for their sons and female teenagers having lower aspirations for themselves (e.g. Beaman et al., 2012). Unless women have the ability to earn an income beyond traditional occupations, females could be perceived as not being in need of good health or education (The PROBE Team, 1999). Hence, through labor force participation, women may achieve economic self-reliance and empowerment and girls may receive more investments in their health and education (Qian, 2008; Jensen, 2010 & 2012; Duflo, 2012).[2]

For many emerging countries, export orientation has been one of the key drivers of economic development (e.g. World Bank, 1993, 2000). From a policy perspective, there is much interest on whether women in these countries would also participate more in the labor force and become more empowered as such when exports increase (UNCTAD Secretariat, 2016). The idea that exports would encourage more women to participate in the labor force has intuitive appeal; however, there is still a lack of evidence on what the causal effect of exports on women's labor force participation is (or if it even exists). While many studies have sought to identify this effect, such studies are typically based on cross-sectional analyses whose results are hard to interpret causally or analyses that do not account for the role of women at home, which may influence women's labor force participation decisions (see, *inter alia*, Özler, 2000; Başlevent & Onaran, 2004; Hossain, 2011).

In this paper, we revisit the issue of whether exports could lead to greater empowerment of women. To do so, we propose a new panel data approach to study the gender specific effects of

[1] This is the third U.N. Millennium Development Goal and fifth U.N. Sustainable Development Goal.

[2] Moreover, in a household, a woman's bargaining power may improve if she has access to labor market opportunities (e.g. Anderson & Eswaran, 2009). By contrast, without earning a wage, her bargaining power will remain constant at best. As such, female labor force participation is a variable considered by the literature as an indicator of women empowerment.

exports on labor force participation and on household work. Our work employs the Indonesian Family Life Survey (IFLS), a large scale household panel dataset, which enables us to study how exports might influence women or men in their decision to enter or exit the labor force, work a certain number of hours, and choose the type of labor activity (e.g. home production versus market work). From an econometric perspective, there are two main challenges when estimating the effect of exports on labor force participation using micro-level panel data. Firstly, because export is a macroeconomic variable, its effect on whether a person works, and how much he or she works, will be confounded by the effects of unobserved regional and global macroeconomic shocks. Secondly, this effect can additionally be confounded by the fact that labor market decisions are often determined jointly within a household (e.g. between husband and wife) with behaviors, norms, and abilities that are unobservable.

To address these concerns, we pursue an identification strategy in which we first construct an *export exposure index* that captures how exposed an individual is to exports. Unlike exports, this index has variation across households and time, which makes it compatible with the use of household and province-year fixed effects to eliminate the confounding household characteristics and macroeconomic shocks described in the above. From the estimated effect of the export exposure index on labor force participation, we may then recover the effect of how exports (not the exposure index) affect the individual's labor market outcome. This estimated relationship between exports and labor force participation is "cleanse" of the confounding effects of unobserved household heterogeneity and macroeconomics shocks at the province or country level, and is otherwise infeasible to obtain by regressing labor force participation directly on exports.

The export exposure index combines two sources of variation: 1) a measure of export exposure and 2) exports themselves. To model exposure, we rely on the observation that in Indonesia, manufacturing exports account for more than half of the country's total exports. This, together with the fact that manufacturing in Indonesia is usually concentrated within large urban areas (Deichmann et al., 2008), imply that the variation in exports would affect individuals in cities more strongly than those in rural areas. To quantify this idea, we first construct the location of each individual

in our sample. Then, for each province, we calculate the individual's *Population Gravity Index* (PGI), which summarizes his or her proximity to all cities in that province weighted by the size (i.e. population) of these cities. Following this, we interact this *province-specific* PGI score with the province's non-fuel exports (termed *exports* hereinafter) to calculate his or her *province-specific* export exposure index. Finally, we sum up this interaction term across all provinces to obtain the *aggregate* export exposure index. Our estimation strategy relies on the fact that this index will amplify the influence of exports for residents in large cities. As such, by exploiting the location specificity of individuals, we may then estimate the effect of exports on the individual while controlling for household and province-year fixed effects.

In our empirical analysis, we consider labor force participation along the extensive margin (i.e. whether a person participates in work) and intensive margin (i.e. the hours of work a person puts in). Surprisingly, for women, we find that an increase in exports may reduce their labor force participation and increase their household and unpaid family work along both extensive and intensive margins. However, for men, exports do not have a statistically significant effect on their employment on both margins, which suggests that their labor supply is inelastic. Hence, even if export orientation generates more employment opportunities, women may not participate more in the labor force. Therefore, to the extent that labor force participation is correlated with empowerment, women may not necessarily be more empowered relative to men with export orientation.

To rationalize our results, we construct a simple collective household model, although it is important to bear in mind that our model offers only one among other possible explanations for why female labor force participation might be negatively related with exports. Our model consists of a husband and wife (representing males and females) who both consume a market good and a household good. We find that if men have a comparative advantage in the labor market and women in producing the household good, the former will devote all their time working for a wage and thus have an inelastic labor supply with respect to exports, while the direction in which exports affect the labor force participation of women depends on the relationship between exports and the gender wage gap. Specifically, if an increase in exports raises the gender wage gap (which we have

some evidence for with respect to Indonesia), then women would reduce market employment for home production. In other words, a possible mechanism for why exports might have a negative effect on female labor force participation is that women have a comparative disadvantage in market work. Hence, if an increase in exports leads to a larger gender wage gap, this will exacerbate the disincentives for women to be in the labor market.

Our Contribution and the Related Literature Our paper makes the following contributions. First, it proposes a new panel data approach for estimating the effect of exports on labor market outcomes that is compatible with the use of household and province-year fixed effects. To our best knowledge, it is one of the few in the literature that uses household panel data to study the relationship between labor force participation on the one hand, and exports or trade on the other hand. Therefore, our paper complements previous studies that are carried out with panel data at the occupation level (e.g. Oostendorp, 2009), firm, plant or industry level (e.g. Paul-Majumder & Begum, 2000; Özler, 2000; Berik et al., 2004; Ederington et al., 2009; Juhn et al., 2014, Bøler et al., 2015), and cross-sectional data at the country level (Bussman, 2009; Potrafke & Ursprung, 2012) or at the household level (Anderson & Eswaran, 2009).

Second, in using household panel data, we may gain further insights into the joint labor market response of men and women in the household when faced with external forces such as an increase in exports. In particular, with the IFLS, we have the benefit of being able to study the individual's labor market outcomes in a somewhat comprehensive way. For instance, we may examine a person's labor market outcome along both extensive and intensive margins, the type of work he or she does, especially in the participation of non-market work such as housework or unpaid work for the family. Such insights could be difficult to obtain if a study is carried out with data at the country, industry, or establishment level, as typically employed by the literature.[3]

Our paper is most closely related to Paul-Majumder & Begum (2000), Özler (2000), Başlevent

[3]However, because we use household panel data, it is not feasible to consider the variation in tariffs to capture trade liberalization as we do not have information on the types of industries the individual is working in. As such, research that exploits the variation in tariffs are usually based on establishment data or labor force survey (see, for example, Juhn et al., 2014).

& Onaran (2004) and Hossain (2011) in that they are concerned with the effects of export orientation on labor market outcomes for women. For example, Paul-Majumder & Begum (2000) and Hossain (2011) focus on the export oriented garment industry in Bangladesh to discuss qualitatively the relationship between the labor force participation (among other matters) of females and increased export orientation; Özler (2000) uses plant level data to estimate the effect of exports by plants on the share of females they employ; Başlevent & Onaran (2004) use Turkish labor survey data to estimate the effect of what they define as export orientation on labor force participation.[4] Unlike our work, Paul-Majumder & Begum (2000) and Hossain (2011) do not provide estimates of the causal effect of exports or export orientation on female labor force outcomes, while Özler's (2000) estimate could be confounded by plant or other unobserved heterogeneity as her regression does not exploit fixed effects.[5] Although Başlevent & Onaran (2004) is the closest to our work in the sense that they look at the effect of exports on *individuals'* labor force participation, they do not attempt to disentangle the effect of exports on individuals from the effects of other macroeconomic factors. Hence, unlike our work, their estimated effect of exports could be capturing the influence from other macroeconomic factors, and because of this, we cannot conclude from their work if a causal effect of exports exists.

Our work is also more broadly related to the literature on female empowerment and globalization, given that export orientation is a form of globalization as well. Although we might expect globalization to have a positive effect on female empowerment, studies based on cross-country and labor survey data are largely inconclusive about the direction of this relationship. For instance, studies based on cross-country data have suggested, on the one hand, that globalization is associated with increased female labor participation in developing countries (Bussman, 2009) and a positive change in social institutions related to gender equality and labor rights for women (Potrafke & Ursprung, 2012; Neumayer & Soysa, 2007). However, on the other hand, there is also evidence that these positive effects of globalization are only limited to middle-income and rich countries, and irrelevant for developing countries (Oostendorp, 2009; Neumayer & Soysa, 2011). Similarly, the studies based on labor survey data have found that globalization may induce competitive effects that reduce gender

[4]Başlevent & Onaran (2004) define the export-orientation variable index at the province level as the employment weighted average of the export to output ratios of the four-digit industries.

[5]Özler's (2000) has plant level panel data from 1983 to 1985 but plant fixed effects are not employed in her work.

discrimination along the lines of Becker (2010) (e.g. Berik et al., 2004; Ederington et al., 2009).[6] However, there is also evidence that these pro-competitive effects benefit not all, but specific women (Başlevent & Onaran, 2004). The difference between our work and this literature is that we examine this issue from a household perspective and attempt to deal with certain confounding factors by proposing a method to estimate the effect of exports on labor force participation within a household panel fixed effects framework.

While our paper takes a household level perspective, there is a large literature that offers various perspectives on why trade may affect the gender wage gap or the female labor force participation rate. For instance, Verhoogen (2008) shows that exports are associated with quality upgrading within exporting firms, which can increase the relative demand for skilled workers. If men are more skilled than women, an increase in exports may increase the gender wage gap. Juhn et al. (2014) argue that export opportunities encourage firms to invest in new technologies, which could increase the employment opportunity for women by reducing the amount of physical strength required for production work. Do et al. (2016) and Gaddis & Pieters (2016) focus on the sectoral structure of production and employment and show that trade liberalization can have gender-specific impacts through the variation in the female share of workers across sectors. Bøler et al. (2015) argue that exports increase statistical discrimination against women, as exporting firms require more committed workers but may perceive women to be less committed. Hence, export growth could be followed by a larger gender wage gap within firms and sectors. Sauré & Zoabi (2014) show that if the female intensive sector is capital intensive while the male intensive sector is labor intensive, the female labor force participation rate may actually decline if trade expands the female intensive sector. This is because males could reallocate to the female intensive sector and dilute the capital-labor ratio there, which would then lower the marginal productivity of women and discourages their labor force participation.

Finally, we would like to highlight certain advantages and disadvantages of our approach. One advantage is that it is designed to accommodate the use of household and province-year fixed effects

[6] In other words, competitive pressures from globalization will make it more costly for employers to discriminate against females of equal abilities as males.

while estimating the effect of exports on labor market outcomes. However, the disadvantage is that the effect of exports is a local treatment effect, as it is relevant to those residing in heavily populated areas and not necessarily to those living elsewhere. Another advantage of our approach is that we may disentangle the effect of exports from the effect of imports in household panel regressions. In the related literature, tariff movements are sometimes used to identify the causal effect of trade liberalization (e.g. Topalova, 2007; Gaddis & Pieters, 2016). However, based on the impact of tariff movements, it is not easy to disentangle what the effects of exports or imports are. Therefore, from a methodological perspective, our paper complements this literature by developing an approach that can shed light on the effects of exports and imports, subject to the caveat that these effects are local.

The rest of the paper is organized as follows. Section 2 provides some background information on Indonesia. Section 3 describes data, key variables and empirical model. Section 4 discusses our results and Section 5 presents our collective household model. Section 6 concludes.

2 A Background on Indonesia

Our interest in Indonesia is motivated by several factors. Firstly, exports have played an important part in transforming Indonesia's economy. From the mid-1980s, the government pursued an active export-oriented trade policy, with a reduction in tariffs and tarrification of non-trade barriers. In 1995, Indonesia became a WTO member and in the process the nominal tariffs were reduced from 17.2 percent in 1993 to 6.6 percent in 2002. Although Indonesia was significantly affected by the 1997 Asian financial crisis,[7] it managed to recover rapidly, as reflected by the 15% increase in exports it posted over the pre-crisis (1990–96) average export value merely two years after the crisis.

Secondly, the Indonesian government have been trying to put in place pro-women policies such as the Presidential Instruction Number 9/2000 on Gender Mainstreaming in National Development for integrating women's perspectives into planning by both central and local governments, compul-

[7]Total value of exports fell by 6% in 1997 and 12.6% in 1998, with a significant reduction in non-oil primary and manufacturing products.

sory education for children to reduce the gender gap at schools, etc.[8,9] Despite these efforts, the labor force participation rate of men in Indonesia remains substantially higher than that of women. For example, from 2000 to 2008, the participation rate of women fell across all age groups and from 60% to 54% on average, while the average participation rate of men stayed roughly constant at 87%. This declining trend in female labor force participation rate appears somewhat puzzling as one would expect exports, which have been rising in Indonesia, to generate more job opportunities for women.

Thirdly, Indonesia has substantial within country diversity in economic performance and geography.[10] For example, the per capita income in East Kalimantan (one of the richest provinces) is roughly 16 times that of Maluku (one of the poorest); provinces such as Aceh, Papua, Riau and East Kalimatan are rich in natural resources while Jakarta and West Java are the country's centers for finance, manufacturing and construction.[11] Moreover, West Papua and Sulawesi are highly remote with population densities of less than 10 and 97.4 people per square kilometer, respectively, while Java Island, which consists of West Java, Central Java, East Java and Banten, is the most populous island in the world with nearly 1,100 people per square kilometer (in 2014). The diversity in economic performance within Indonesia, as well as in the type of environments that individuals live in (e.g. from highly rural to highly urbanized areas), is useful in helping us construct an export exposure index that has substantial variation.

Finally, in the IFLS, Indonesia has arguably the most comprehensive household panel dataset for any developing country. This allows us to employ appropriate fixed effects strategy to address certain issues in estimating the effect of exports on individuals' labor force participation, which are discussed further in Section 4.4.

[8] According to the World Bank Gender Statistics database, in 1970, the ratio of female to male students enrollment was 86% in primary schools, 53% in secondary schools, and just 32% in tertiary institutions. By 2007, these ratios increased to almost 100%.

[9] See the UN Report: Indonesia, Overview of Achievements and Challenges in Promoting Gender Equality and Women's Empowerment.

[10] Indonesia is the world's largest archipelagic state with 13,000 islands over 34 provinces. Indonesia is also the third largest developing country after China and India.

[11] See Hill et al. (2008).

3 Empirical Analysis

3.1 Data

Our dataset is assembled using three waves (1997, 2000 and 2007) of the Indonesian Family Life Survey (IFLS) panel data. The IFLS is an on-going longitudinal household survey where the first wave was conducted in 1993 (IFLS1), then in 1997/98 (IFLS2 and IFLS2+), 2000 (IFLS3) and 2007 (IFLS4). In IFLS1, 7,224 households were interviewed and detailed individual-level data were collected from over 22,000 individuals with a re-contact rate of 94.4% in IFLS2, 95.3% in IFLS3 and 93.6% in IFLS4.[12] The survey collects a wide range of information related to individuals and the households they belong to. For our work, we use the IFLS2, IFLS3 and IFLS4 waves, but not the IFLS1 wave as questions on employment in this wave are sometimes phrased differently from the other waves.[13] Besides employment data, we rely on the IFLS for information on a person's labor supply, gender and marital status.

Our source of trade data comes from the CEIC Indonesian premium database. This database provides information on the value of exports and imports (valued in Indonesian rupee and excluding oil and gas) at the province level based on export-import declaration documents issued by the Custom and Excise Offices. These documents report the international transactions of exports and imports from each province, although we cannot the exclude the possibility that certain provinces may serve as transits for the exports and imports of other provinces. Finally, our information on cities and city populations comes from the 2010 Population Census of Statistics Indonesia (Badan Pusat Statistik).[14] We also use ArcGIS to construct the geodesic distance between where the individual resides in and each city in the country. These distances will then be used for constructing the export exposure index below.

[12] For the individual target households (including split-off households as separate) the re-contact rate was a little lower, 90.6% (Strauss et al., 2009).

[13] While we were writing this paper, a new wave (IFLS5) was released.

[14] We use the 2010 data as cities may be defined differently across years, and data on city population may not be available for the years during which the IFLS waves are reported.

3.2 Key Variables

Export Exposure Index The main explanatory variable in this paper is the export exposure index that measures the exposure of person i to exports at time t. This index, represented by $Export\_Exposure_{it}$, is constructed in two steps. First, for each province j, we construct the *Population Gravity Index* (PGI) for person i that measures i's exposure to province j's cities, as reflected by his or her proximity to these cities weighted by population. Second, we interact this PGI score with province j's exports in year $t-1$ to create an export exposure index for person i with respect to province j's exports. We then aggregate the province-specific PGI scores over all provinces for this person to construct his or her $Export\_Exposure$ variable – the aggregate export exposure index. The procedure will now be discussed in detail below.

Step 1: Computing the Population Gravity Index

In Indonesia, manufacturing exports are by far the largest among all exports including fuel (the 2nd largest), which is excluded from our export data.[15] Given that manufacturing activities in Indonesia are primarily concentrated in places that are more urbanized than rural (see Deichmann et al., 2008), we model the exposure of an individual to exports based on his or her proximity to cities.

To do so, we construct the PGI score for each individual that consists of (i) his or her distance from cities in province j in time t (i.e. using his or her location at the time of the survey) and (ii) the population of these cities. The PGI score captures the idea that larger cities have greater influence or "gravity" on people than smaller cities do, although this effect will be more weakly felt by someone who lives in relatively more rural areas. In this regard, the PGI score for the individual is positively related to the size of cities and inversely related to how far from these cities a person is. As such, it is related to the idea that cities with larger populations have greater market potential. This is reminiscent of the concept of market access in the economic geography literature, such as that of Redding & Venables (2004), who define market access as the distance-weighted sum of market capacities (GDPs) of all their trade partners. The PGI score is similar in that it uses distance as a

[15] In Indonesia, the share of manufacturing exports is more than twice the share of fuel exports in Indonesia's exports was 57%, the share of fuel exports was 25%, and the share of agricultural exports was approximately 6.5%.

measure of access and city population (instead of GDP) as a measure of market potential.

Formally, for each province j, we construct the PGI score for an individual i based on

$$PGI_{ijt} = \sum_{k \in K_j} \frac{p_k}{(1 + D_{ikjt})^2}, \tag{1}$$

where p_k is the population of city k in province j, K_j is the total number of cities in province j, and D_{ikjt} is the geodesic distance of individual i's location in time t from city k in province j.[16] When computing the PGI scores, we include every city located in each province that is reported by Badan Pusat Statistik. Here, a city refers to a major population center within a certain province that has its own government, and not necessarily a location that has a large population. For example, although Jakarta with population of more than 9 million is a city, Sabang in Aceh Province with a population of about 30,000 people is also a city by the above definition, as it is a population center with its own administration. Therefore, every province will have its own cities, and there are 95 of them throughout Indonesia.[17]

The subdistrict location is the most disaggregated and complete locational information we have for individuals.[18] Hence, we locate the individual by his or her subdistrict postal code. The area of a subdistrict varies across Indonesia and subdistricts tend to be larger in places that are more rural. For example, in the province of West Nusa Tenggara in South Sulawesi, the rural subdistrict of Lunyuk within the Sumbawa district has an area of 513.7km^2. In Java, which is the most populated island in Indonesia, most of its rural subdistricts are smaller than 50km^2. In urbanized districts, such as the district of Padang in West Sumatra, many of its subdistricts (e.g. Padang Selatan, Padang Barat, Padang Timur, etc.) are around 10km^2. Considering that Indonesia is a very large country, the subdistrict location offers us a relatively precise measure of where the individual lives.

To compute D_{ikjt}, we use the centroid of the IFLS respondent's subdistrict (in time t) as a measure of his or her location. Then, we compute the distance between this individual and a particular

[16] As a note, we use the population data in 2010 for reasons discussed in Section 3.1

[17] This is as of 2010.

[18] For residents in rural areas, the village is the smallest administrative level, not the subdistrict. However, location at the village level contains many missing data.

city k in province j as the geodesic distance between his or her subdistrict's centroid and the city's centroid. This is done by first locating these centroids by their latitudes and longitudes and calculating their geodesic distance in degrees (i.e. in the geographic coordinates). After which, to convert these distances into kilometers, which is how D_{ikjt} in the PGI score is measured, we convert the geographic coordinate system to an appropriate projected coordinate system (i.e. equidistant cylindrical projection) using the Proximity Analysis tools in ArcGIS.[19]

The PGI score, expressed by Eq. (1), is determined by two factors. First, in its numerator, we have city population, which captures the idea that larger cities are more influential. In its denominator, we have the distance of an individual from a city, which captures the idea that the city's influence on this person will weaken the further he or she is away from it.

Graphically, how the PGI score is constructed can be visualized from Figures 1 and 2. Let us consider a resident in Jakarta, Indonesia's capital city (Figure 1), and a resident in Bima, a small city in the province of West Nusa Tenggara (Figure 2).[20] For the Jakarta (Bima) household, we compute the geodesic distances between Jakarta (or Bima) and the other cities, where larger (smaller) cities are represented in the map by a larger (smaller) marker. Notice that Bima is more remote than Jakarta, in the sense that Bima is far away from major cities while Jakarta is a major city itself. Hence, the residents in Bima will have a smaller PGI score than what the residents in Jakarta will have.

We like to make the following clarifying remarks on how the PGI score is constructed. Firstly, for the sake of presentation, we use city population in millions for the numerator of the PGI score. If we use the actual population instead, the coefficient on the export exposure index will be too small (i.e. have too many leading zeros in its decimal place), which makes reporting it inconvenient.[21]

[19] We use projected coordinate system because geographic coordinate system create large distortions along a number of dimensions and as we move away from the equator. Projected coordinate systems project the round surface of the earth on to a flat surface and calculate distances in meter not in degrees. However, all coordinate systems create some distortions and different projects minimize distortions along different dimensions. An equidistant cylindrical projection is a method of calculating distance in projected coordinated system. The reason behind choosing the equidistant cylindrical method is that it has minimal distortion along the distance dimension and hence is useful for calculating distances.

[20] Administratively, Bima is a district and not a subdistrict. However, for the purpose of computing the PGI scores, we treat Bima as a subdistrict as the actual subdistricts in Bima are very small (e.g. the subdistrict of Belo in Bima is only 0.11km^2.)

[21] If we use the actual population, the PGI score would be very large for individuals living close to large cities. As a

Secondly, in the denominator of the PGI score, we add the value of 1 to the geodesic distances. If not, division by zero becomes possible for households located within a city. Finally, the term $(1 + D_{ikjt})$ in the denominator is squared to allow for the influence of cities on households to diminish more quickly as the distances between them increase. However, it should be emphasized that the estimated effect of exports on labor participation is not qualitatively affected by the choice of $(1 + D_{ikjt})$ or $(1 + D_{ikjt})^2$ as the denominator.[22]

Step 2: Computing the Export Exposure Index

The province-specific PGI score for person i captures the influence that cities in that province (say, province j) have on him or her. To model i's exposure to province j's *exports*, we interact the latter with the province-specific PGI score for i (i.e. PGI_{ijt}). The idea is that our export data comprises mainly of manufacturing exports, which are mostly produced in urban areas. Therefore, how strongly exposed person i is to province j's exports depends on his or her proximity to province j's cities.

To construct our (aggregated) export exposure index, we aggregate this interaction term over all provinces (indexed by j):

$$\begin{aligned} Export\_Exposure_{it} &= \sum_{j \in J} \left(\sum_{k \in K_j} \frac{p_k}{(1 + D_{ikjt})^2} \ln(Export_{jt-1}) \right) \\ &= \sum_{j \in J} PGI_{ijt} \ln(Export_{jt-1}), \end{aligned} \tag{2}$$

where $Export_{jt-1}$ is the total export from province j in the year $t-1$. We use this instead of the year t exports (i.e. $Export_{jt}$) as the year t is associated with the year during the IFLS was conducted.[23] Thus, $Export_{jt}$ will contain information about exports after the survey has been done. To study the effect of exports on labor force participation (if it exists), it is best that we use data on exports from

result, the export exposure index (which is constructed using the PGI score) for these individuals will be very large and the coefficient on the index will be very small.

[22]The estimation results with the PGI scores calculated using $(1 + D_{ikjt})$ is available from the authors upon request.

[23]In the case of IFLS 2, it was conducted in 1997 (IFLS2) and 1998 (IFLS2+).

the year prior to the year that the IFLS was conducted.[24]

As a further remark, it should be pointed out that unlike exports, the export exposure index contains variations across individuals and years. By employing the export exposure index as our explanatory variable, we may then use household and province-year fixed effects to deal with certain confounding issues (see Section 4.4). Therefore, as an estimation strategy, we will first estimate the impact of the export exposure index on labor force participation, and then recover the effect on labor force participation that exports (not the index) might have.

Labor Force Participation We use several variables to measure an individual's employment at the extensive or intensive margin. In the baseline case, the extensive margin of work is related to whether that person is engaged in work (paid or unpaid), or does not work. To capture this information, we construct a binary variable *Work*, which is equal to 1 if the individual reports work and 0 if otherwise. To use as dependent variables in our regressions, we also consider the extensive margin of paid employment as well as the extensive margin of work (that consists of paid or unpaid work) in the agriculture, manufacturing or services sector, where pertaining to each sector, we construct a binary variable to indicate if an individual is employed in that sector. Finally, we also use information on the reported types of work, such as an individual being a government worker, being self-employed, being engaged in housework, etc., and create a binary variable for each reported types of work.

Besides the extensive margin, we consider an individual's labor force participation at the intensive margin. To do so, we construct two dependent variables. The first is *Hours_Usual*, which is equal to reported hours of any work that an individual normally does. The second is *Hours_Last_Week*, which is equal to reported hours of any work performed in the previous week. We consider both measures of the hours of work to ensure that our results are not influenced by variable definitions.

Control Variables We consider the following control variables in our regressions. The first control variable is an import exposure index for capturing the effect of imports on labor force participation. The latter is relevant in light of Amiti & Davis (2011) and Amiti & Cameron (2012) who have

[24] In other words, we need to use exports data from January 1 to December 31 of that year.

shown that imports may affect wages in Indonesia.[25] If imports affect labor force participation through their effects on wages, it would be important that we control for information about imports in our regression. To this end, we construct an import exposure index in the same way as we did for the export exposure index as follows:

$$\begin{aligned} Import\_Exposure_{it} &= \sum_{j \in J} \left(\sum_{k \in K_j} \frac{p_k}{(1 + D_{ikjt})^2} \ln(Import_{jt-1}) \right) \\ &= \sum_{j \in J} PGI_{ijt} \ln(Import_{jt-1}). \end{aligned} \tag{3}$$

We use the import exposure index as opposed to import volume to control for information about imports, for the same reason that this index will not be "cleaned out" from a regression with household and province-year fixed effects.

The second control variable is the person's age. This is motivated by Jensen (2012) who finds that younger women are significantly less likely to get married, tend to have fewer children, and are more likely to work. In other words, older women are more likely to engage in unpaid home production than in market work, in which case, age will be correlated with labor force participation. To allow for the relationship between work and age to have a nonlinear profile, we include age squared as a control variable as well.

Summary Statistics Table 1 provides a list of the main variables used in this paper. Our data is based on a panel of married males and females aged from 20 to 65 years for the years 1997, 2000 and 2007. We exclude those below 20 years old as they might still be in school. Our base sample contains 12,784 individual-year observations for married females and 16,116 individual-year observations for married males. The summary statistics of the main variables are reported in Table 2. Compared with males, females on average are less likely to report being employed. Moreover, for those who are employed, females also work fewer hours than males on average. Across sectors, working females

[25] For instance, Amiti & Davis (2011) find that in Indonesia, a fall in input tariffs may increase wages in import-using firms relative to wages in firms that buy their inputs domestically. Amiti & Cameron (2012) also find that in Indonesia, the production of intermediate inputs tends to be more skilled-intensive than production of final goods; therefore, a reduction in input tariffs can reduce the skill premium.

are more likely to be employed in the services sector than in the agricultural and manufacturing sectors. Compared with males, females are also less likely to be self-employed, or be a government or salaried employee, and they are more likely to be involved in housework or unpaid family work.

3.3 The Estimating Equation

Our main estimating equation relates an individual's decision to work (at the extensive or intensive margin) to the export exposure index ($Export\_Exposure$),

$$W_{it} = \mu_h + \alpha_p * \alpha_t + \beta \; Export\_Exposure_{it} + \boldsymbol{\gamma}' \mathbf{Z}_{it} + \epsilon_{it}. \tag{4}$$

where W (subscript suppressed) is a generic representation of work that represents either the extensive margin of work (*Work*) and the intensive margin of work (*Hours_Usual* or *Hours_Last_Week*). Eq. (4) also includes a vector of individual level controls denoted by $\mathbf{Z}_{it}$. This vector consists of the import exposure index (see Eq. (3)), the age and the squared of age of the individual. Finally, the model also includes household fixed effects represented by μ_h and province-year fixed effects represented by $\alpha_p * \alpha_t$.

Our main objective is to estimate the parameter β in Eq. (4), which is the coefficient on the export exposure index. Although β summarizes the effect that export exposure might have one's decision to work, we can only interpret its sign but not its size. This is because the size of β depends on the chosen unit of measurement for city population that is used when we construct the PGI score. If we use city population in millions to construct the PGI score, $Export\_Exposure$ will have a smaller magnitude and as a result of this scaling, β will be larger. Conversely, if we use the actual population instead, the magnitude of β will be reduced. As discussed, we construct the PGI score with city population in millions so that the estimate of β will have fewer leading zeros in its decimal places, which allows us to present our results more neatly in the tables.

The sign of β has a meaningful interpretation. For example, based on Eq. (2), we can calculate

the effect that a 1% increase in (time $t-1$) exports across all provinces has on work as

$$\frac{\beta}{100} * \sum_{j \in J} PGI_{ijt}. \tag{5}$$

Because the PGI score is positive, whether exports affect labor force participation positively or negatively depends on the sign of β; if β is positive, both export exposure and exports will have positive effects on average.

From Eq. (5), notice that the effect of exports is heterogeneous across individuals. In particular, the effect will be weaker for residents in rural areas or in small cities, as they will have a small aggregated PGI score ($\sum_{j \in J} PGI_{ijt}$). By contrast, the effect will be stronger for residents in large cities such as Jakarta, as they have the largest aggregated PGI score. The heterogeneity in the effect of exports, which is shown in Eq. (5), allows us to use an appropriate fixed effects strategy to address certain estimation issues that are discussed below.

3.4 Estimation Issues

Reverse Causality One common estimation issue is reverse causality. For this to be a concern in the context of our model (see Eq. 4), an individual's decision to work has to have influence on *Export_Exposure*. However, this is unlikely as the time series variation in *Export_Exposure* comes from provincial level exports, which would not be influenced by an individual.

Unobserved Locational Characteristics and Self-Selection into Work While the time series variation in *Export_Exposure* is driven by provincial exports, the cross-sectional variation in this index comes from the location of households. Locations may differ in their job market characteristics such as labor market tightness, the importance of certain types of industries, etc. For example, because of agriculture such as palm oil production, the labor force participation rate can be higher in rural than in urban areas for both gender (Agrawal, 1996; Cameron, 2002). As such, there could be cross-sectional variations in the labor force participation rate due to variations in the characteristics (e.g. rural versus urban) of where the individual resides in. Another concern is that decisions to

participate in the labor force are often determined jointly within the household. Such decisions may be driven by the availability of job opportunities for women as well as behaviors, norms and abilities of the household that are unobservable. However, to the extent that job decisions are influenced by persistent locational and household characteristics, these confounding factors can be eliminated by household fixed effects.

Unobserved Macroeconomic and Policy Shocks The effect that exports on the labor force decisions of individuals are likely to be confounded by macroeconomic and policy shocks. These factors may include business cycle shocks that affect provinces differently, as well as province specific unemployment rate and GDP growth that affect the tightness of regional labor markets. Other confounding factors may also include persistent factors such as institutions or cultural norms at the province level, which could be correlated with whether women are more likely to work. To eliminate these confounders, we include province-year fixed effects (α_{jt}) to capture all factors – observed or unobserved, time-varying or time invariant – at the province and national levels. This is especially important in the context of large countries with decentralized governments, as not only may a person be affected by external factors such as exports or trade but also by state- or province-specific economic and policy shocks and trends.

Measurement Error Our *Export_Exposure* variable is constructed using individuals' location and the value of exports at the province level. While the respondent's location is unlikely to be misreported because this information has been cross-checked by the surveyor,[26] the provincial export data could be mismeasured. If this measurement error is classical, the estimated effect of *Export_Exposure* will be attenuated. Measurement error may also be present in self-reported employment data. For instance, women could be reluctant to report truthfully that they work because of social stigma and norms (see Schaner & Das, 2016). In this case, the self-reported labor force participation data for women would be less responsive to *Export_Exposure* than what is true in reality.

Unfortunately, panel data regression cannot address the issue of measurement error. Nonetheless,

[26]The information about the location was cross checked by the surveyor with the answer of household (Source: IFLS user guide).

if these measurement errors lead to attenuation bias (which Section 5 offers some evidence for), our regression estimates would still be informative about the actual effect of *Export_Exposure* as they would bound this effect from below.

Other Issues Households with better abilities may self-select into locations that offer better job opportunities. This is dealt with by the use of household fixed effects to the extent that abilities are persistent.

The effect of exports on labor force participation in Eq. (5) can be interpreted as a treatment effect where individuals in large cities are in the treatment group and others in the control group. Intuitively, a person in a large city such as Jakarta will have a large PGI score, which means that the influence of exports on him or her could be large. Conversely, a person in a small city or in a rural area will have a very small PGI score, so that exports will have a negligible effect on him or her. Therefore, we may interpret the variation in exports as a treatment, individuals in large urban areas as the treatment group, and those in small cities or rural areas as the control group. In this case, the estimated effect of exports in Eq. (5) may only be local to individuals in large cities, and not necessarily externally valid for residents in small cities or in rural areas.

4 Results

We estimate Eq. (4) separately for men and women. Other than Table 3, we report our results for women in the "A" affixed tables (e.g. Tables 4A, 5A, etc.) and men in the "B" affixed tables (e.g. Tables 4B, 5B, etc.). Standard errors have been adjusted for clusters at the household level. All our regressions control for age, the squared of age, household and province-year fixed effects.

4.1 The Extensive Margin of Work

4.1.1 Baseline Results

We first examine the relationship between *Export_Exposure* and the extensive margin of work. The latter is represented by the binary variable *Work*, which is equal to one if the individual reports having worked in the past week. For now, work could refer to either paid work or unpaid work such as work on a family farm. Later, we will consider the response of different types work (e.g. paid, unpaid, etc.) to exports. As *Work* is a binary dependent variable, the coefficient on *Export_Exposure* captures its effect on the *probability* that the individual participates in some form of work.

In Column (1) of Table 3, the coefficient of -0.260 on *Export_Exposure* suggests that women are less likely to work when exports increase. Although this coefficient is not meaningful in the quantitative sense, we may use it to recover the effect that a 1% increase in exports across all provinces has on the labor force participation of individual i in time t. Following Eq. (5), this effect (for women) is given by

$$-\frac{0.260}{100} * \sum_{j \in J} PGI_{ijt} \equiv -\frac{0.260}{100} * \sum_{j \in J} \sum_{k \in K_j} \frac{p_k}{(1 + D_{ikjt})^2}. \tag{6}$$

According to Eq. (6), the effect of exports on *Work* is heterogeneous in that it is stronger for women living near or within metropolitan areas and weaker for those who are located further away. For example, women who live in central Jakarta have an aggregate PGI score (i.e. $\sum_{j \in J} PGI_{djt}$) of 11.406. Therefore, Eq. (6) suggests that on average, women in central Jakarta are 2.96 percentage points less likely to work when exports increase by 1% across all provinces.[27] By contrast, for women in Bima, a 1% increase in exports across all province has a negligible effect on whether they work. As a caveat, we have to be mindful that the impacts of exports and of *Export_Exposure* on labor participation are local to residents in large cities; these effects may not be externally valid for residents in small cities or in rural areas.

For men, *Export_Exposure* is not statistically significant (Column (2)), which suggests that their labor supply is inelastic with respect to exports. These results are consistent with the predictions

[27] To calculate this, we replace $\sum_{j \in J} PGI_{djt}$ with 11.235 in Eq. (6) to obtain $-0.260/100 * 11.406 = 0.0296$, which is 2.96 percentage points.

from a simple collective household model discussed in Section 5.

Extensive Margin of Paid Employment We examine the effect of *Export_Exposure* on the extensive margin of *paid employment*. Here, we construct two binary dependent variables: *Own_Income* $(= 1)$ if the person reports having earned an income from work and *Spouse_Income* $(= 1)$ if the same person reports that his or her spouse has earned an income from work. Therefore, the men in our sample will report *Own_Income* about themselves and *Spouse_Income* about their wives. Likewise, the women will report *Own_Income* about themselves and *Spouse_Income* about their husbands.

In this way, a person's participation in paid employment will be reported twice. For example, for a male, whether or not he has participated in paid employment will be recorded once when he reports *Own_Income* for himself and again when his wife reports *Spouse_Income* about him. Hence, in the absence of any reporting discrepancy between couples, the information in *Own_Income* reported by men (women) will be the same as *Spouse_Income* reported by their wives (husbands).

For men, we find that *Export_Exposure* is statistically insignificant for participation in paid employment, both for paid employment reported by their wives (Column (2) of Table 4A) or themselves (Column (1) of Table 4B). By contrast, for women, we find that *Export_Exposure* has a negative impact on paid employment as reported by their husbands (Column (2) of Table 4B). These results suggest two things.

Firstly, they are in line with our baseline findings that an increase in exports reduces participation by women but not by men. Secondly, for women, the effect of *Export_Exposure* on participation in paid employment (as reported by their husbands) is -0.646. This is nearly two and a half times the estimate of -0.260 in the baseline regression (see Table 3), where *Work* is more broadly defined as participation in paid employment or unpaid work for the family. Therefore, this suggests that the effect of exports on women's participation in paid employment is much stronger than on participation in unpaid family work.

Measurement Error As we have information on participation in paid employment reported by both self and one's spouse, we may use it to investigate if there is measurement error in women's

self-reported employment data. Schaner & Das (2016) argue that social stigma and norms are very important in Indonesia, which could make women reluctant to reveal their employment status. If so, then what they have reported about themselves could be less reliable than what their husbands have reported about them.

Tables 4A and 4B offer some evidence that women's self-reported employment data is mis-measured. For example, the coefficient on *Export_Exposure* is 0.0741 when women's self-reported participation in paid employment is used (Column (1) of Table 4A). This is only about a tenth of the coefficient of 0.646 when women's participation is based on the information provided by their husbands (Column (2) of Table 4B). Therefore, when women's self-reported information is used (as in the baseline regression), the actual effect of exports on women's labor participation could be understated. Consequently, throughout this paper, our results on the effect of exports on women's employment could be attenuated as our employment data is mainly self-reported.

Causality versus Correlation We conduct a placebo test to examine if the negative association between exports and women's labor participation is causal. To do so, we estimate the effect of *Export_Exposure* on the lag of *Work*, defined as work status from the previous IFLS wave. The idea is that a forward variable cannot cause variables of the past; therefore, *Export_Exposure* cannot affect the lag of *Work* in the causal sense.[28]

As such, if the "effect" of *Export_Exposure* on the lag of *Work* is statistically significant, this could be due to (i) *Work* reverse causing *Export_Exposure*, which we do not believe is true for reasons outlined in Section 4.4, or (ii) unobserved factors driving *Export_Exposure* and the lag of *Work* jointly. These factors could themselves lead to the joint determination of *Export_Exposure* and (contemporaneous) *Work*, which we are concerned with.

To get a sense if our estimates of the effect of exports on women's participation are causal (e.g. Table 3), we check if the relationship between *Export_Exposure* and the lag of *Work* (for women)

[28]We have also arrived at the same conclusion by doing the following. First, we construct the export and import exposure indices where the PGI scores are interacted with the log of exports and imports are at time t (not $t-1$). Then we regress the previous year (i.e. $t-1$) work status on these new export exposure and import exposure indices along with the other controls.

is statistically *insignificant* and find this to be the case (results omitted here to save space). This suggests that there are no unobserved variables important enough to drive *Export_Exposure* and the lag of *Work* jointly, which we worry could drive *Export_Exposure* and (contemporaneous) *Work* jointly as well. For reasons given in the above, this suggests that exports have a causal effect on women's labor force participation.

4.1.2 By Sector

The IFLS provides information on which sector the respondent was employed in. We examine the relationship between exports and participation in one of the three sectors – agriculture, manufacturing and services. For each sector, we construct a binary dependent variable that indicates if the individual is employed (paid or unpaid) in that sector. Manufacturing is the largest exporting sector in Indonesia: in 2010, the value share of manufactures in total exports was 57%. Agriculture, with the share of 6.5% in 2010, is the next largest exporting sector under consideration here. By contrast, services in Indonesia are mostly non-traded. In our sample, 32% of all women and 35% of all men report working in agriculture, 16% of women and 13% of men in manufacturing, and 50% of women and 36 % of men in the services.

For women, Table 5A shows that an increase in exports reduces the probability of work in the agricultural sector on average, with *Export_Exposure* having a coefficient of -0.105 (statistically significant at 1% level). However, this effect is weaker than the effect that exports have on participation in the manufacturing sector. With a coefficient of -0.134 on *Export_Exposure*, a woman with an average aggregated PGI score would be 0.026 percentage point less likely to work in the manufacturing sector (compared with 15.2 percentage points for women in Jakarta) when exports across all provinces increase by 10%.[29] For the services sector, we find that exports do not have a statistically significant effect on women's participation. Therefore, the negative effect that exports have on women's participation is mainly due to the attrition of women from the agricultural and manufacturing sectors when exports increase.

[29]The average aggregated PGI score for women is 0.0269. For agriculture, the calculation is based on $(-0.105/100) * 0.0269 = -.000028$. For manufacturing, it is $(-.134/100) * 0.0269 = -0.000036$. To obtain the estimates for residents in Central Jakarta, we can use their aggregated PGI score of 11.40.

For men, we look at how exports are related to their participation in the agricultural, manufacturing, services and construction sectors. The construction sector is the forth largest sector of male employment, where nearly 8% of all men in our sample are employed. Similar to our baseline regressions, we do not have evidence that exports affect men's participation in each of the four sectors. This is consistent with the notion that their labor supply is inelastic with respect to exports.

4.1.3 By Types of Work

We examine the effect of exports on participation in various (non-mutually exclusive) types of work: self-employment, housework (i.e. housekeeping), employment with the government, salaried work, or unpaid family work. Columns (1) of Tables 6A and 6B show that exports are statistically insignificant for self-employed work regardless of gender. For women, this is consistent with the observation that exports are statistically insignificant for women's participation in the services sector (Table 5A), as the majority of self-employed women are in the services.[30] For men, the result is also consistent with the fact that exports do not have much influence on labor participation in general (Table 5B).

With respect to participation in housework, Columns (2) of Tables 6A and 6B show that an increase in exports leads to more household work undertaken by women on average but not by men. These results mirror Columns (3) of Tables 6A and 6B, which show that an increase in exports leads to less participation by women in paid employment but has no effect on men. As a remark, we have also looked at the effect of exports on the extensive margin of paid employment in the agricultural, manufacturing and services sector, where the results are omitted here. For each of these sectors, we find that the effect of exports is negative and statistically significant (at 5%) for women but is statistically insignificant for men. These observations are consistent with exports having a negative effect on women's participation in paid employment (Tables 4A and 4B) as well as employment across sectors in general (Table 5A).

Finally, for both men and women, Columns (4) of Tables 6A and 6B shows that participation

[30] According to Table 2, 42% of females and 50% of males in our sample report being self-employed. However, for self-employed females, 35% of them work in agriculture, 14% in manufacturing and 48% in services. By contrast, for self-employed males, 37% of them work in agriculture, 11% in manufacturing, 34% in the services and 7% in construction.

in government related work is largely unaffected by exports. This is consistent with the notion that public sector jobs are usually better insulated from macroeconomic shocks. In Columns (5) of Tables 6A and 6B, we also find that the effect of exports on unpaid family work is statistically insignificant regardless of gender. For women, this result could be explained by the fact that a large proportion of those in unpaid family work (i.e. 26%) are in the services sector, and previously, we have found that those who work in the services are generally unresponsive to exports (see Table 5A).

In sum, recall that our baseline regression considers work to encompass participation in paid market work and unpaid family work. Since the relationship between exports and unpaid family work is statistically insignificant, this suggests that the negative effect of exports on women's participation in our baseline regression (see Table 3) is driven mainly by a reduction in paid work and not in unpaid family work at the extensive margin.

4.1.4 By Previous Year Work Status

Each IFLS wave provides information on whether a person had been working or unemployed in the year before the survey was conducted. Here, we take a look at the relationship between exports and the decision to start or stop working. Specifically, we investigate if an increase in exports today could encourage those who had been working (or have not been working) in the year before to exit (enter) the labor market. For women who had not been working, Table 7A shows that exports do not have a statistically significant effect in encouraging them to work. By contrast, for women who had been working, an increase in exports encourages them to exit the labor market. This is consistent our baseline result that exports have a negative effect on women's labor force participation.

For men who had been unemployed, an increase in exports increases the likelihood that they become employed, although the result is not statistically significant. For those who had been working, we find no evidence of attrition from the labor force when exports increase. Hence, men who were unemployed would try to gain employment and those who were already employed would stay employed.

4.2 Intensive Margin of Work

Finally, we investigate how exports are associated with the intensive margin of work, as reflected by the hours of work performed by the employed. We estimate the effect of *Export_Exposure* on *Hours_Last_Week* (see Tables 8A and 8B) or *Hours_Usual* (see Tables 9A and 9B), where recall that *Hours_Last_Week* is the reported hours of any work performed in the previous week, and *Hours_Usual* is the reported hours of any work that an individual normally does.

We first examine the relationship between exports and the intensive margin of work by types of work. Here, we find that an increase in exports has a negative and statistically significant effect on women's hours of salaried work (based on either *Hours_Last_Week* and *Hours_Usual* as the measure of the intensive margin of work). Therefore, exports may reduce participation in salaried work by women along the intensive margin, as well as along the extensive margin as was reported in Table 6A. In addition, we find that an increase in exports increases women's hours of unpaid family work and hours of housework. Therefore, an increase in exports encourages women to substitute their time away from paid market work towards unpaid non-market work.

For the relationship between exports and the intensive margin of work by sector, there is little we can take away as the estimated coefficient on *Export_Exposure* is mainly statistically insignificant.

4.3 Control Variables

In general, for women, the impact of import exposure is opposite of that of export exposure on both extensive and intensive margins of labor force participation. Hence, an increase in imports would have a positive effect on the labor force participation of women and the hours they work on average. This observation is consistent with Gaddis & Pieters (2016) where they find that trade liberalization through a reduction in import tariffs has had a positive effect on women's labor force participation. For women, the (absolute) effect-size of import exposure is also similar as that of export exposure, which suggests that the marginal effect of an increase in imports would negate the marginal effect of an increase in exports. As such, if we focus on the effect of trade exposure (i.e. exposure to exports *plus* imports) on female labor force participation instead, we would find the effect to be weak even

though the effects of export and import are statistically significant.[31]

For men, import exposure is mostly statistically insignificant. Therefore, there is no evidence that the labor force participation of men is influenced by imports, which is consistent with our earlier observations that their labor supply is inelastic.

5 A Simple Collective Household Model

In this section, we study a simple collective household model to understand how our empirical results may arise. In this representative household, we have a husband and wife (representing males and females) who jointly maximize a household's utility function given by[32]

To consume H and q, the husband and wife allocate the one unit of time endowment they each have to paid market work and unpaid housework.[34] We denote the amount of husband's and wife's time devoted to the housework (or paid employment) by t^m and t^f (or $l^m = 1 - t^m$ and $l^m = 1 - t^m$) respectively. The common non-market household good (H) can be thought of as child-caring or housework; it is produced with t^m and t^f:

$$H = h\left(\rho t^f + t^m\right), \tag{9}$$

where ρ is a measure of the absolute advantage in producing H the wife has, and $h(\cdot)$ is an increasing and concave function. The amount of the private good consumed by the husband and wife (i.e. q^m

[31] We find that the impact of trade exposure on female labor force participation is statistically insignificant.

[32] See Browning et al (2014) for an analysis of various household models,

$$U = \mu U^f\left(H, q^f\right) + U^m\left(H, q^m\right), \tag{7}$$

where $U^f(\cdot)$ is the utility function of the wife, $U^m(\cdot)$ is the utility function of the husband, μ is a measure of the relative bargaining power of the wife,[33] H is the amount of common non-market household good consumed, and q^f and q^m are the private consumption levels of the market good. For simplicity, let the preferences of each agent over H and q be represented by the same Cobb-Douglass utility function:

$$U(H, Q, q) = AH^{\alpha} q^{1-\alpha}. \tag{8}$$

[34] Note that we ignore the notion of leisure in our simple model.

and q^f) is equal to the income they earn from market employment:

$$q^f + q^m = w^m l^m + w^f l^f, \tag{10}$$

where w^m and w^f are the market wages for men and women.

The time allocation between market and non-market activities among the couple and the optimal level of private consumption can then be determined by maximizing the household's utility function based on Eqs. (7) and (8) subject to constraints given by Eqs. (9) and (10).

To solve the model, first define the gender wage gap (ω) as the ratio of wages of the husband and wife. Suppose ω satisfies the condition

$$\omega = \frac{w^m}{w^f} > \frac{1}{\rho}, \tag{11}$$

which implies that the husband has a comparative advantage in paid employment and his wife in housework. The first order conditions with respect to t^m and t^f then suggest that the husband allocates all his time to paid work (i.e. $t^m = 0$ and $l^m = 1$) while his wife divides her time between housework and paid employment.

Therefore, if exports affect the wages of the husband and wife such that Eq. (11) continues to hold, it will not affect the husband's employment along the extensive margin (as he will continue to work) and intensive margin (as he will continue to devote all his time to paid employment).[35] For his wife, the budget constraint in Eq. (10) and the first order condition for q^f and t^f suggest that she will allocate her time between paid employment and housework according to

$$\rho\alpha \left(1 - t^f + \omega\right) h' = (1 - \alpha)\, h. \tag{12}$$

[35]The result that males spend all their time in paid employment is generated by the assumed pattern of comparative advantage and the substitutability of the male and female time input in the household production function. See Blundell et al (2007) for a collective household model with discrete non-participation decision.

If the wage gap (i.e. ω) is positively associated with exports, Eq. (12) shows that

$$\begin{aligned}\frac{dt^f}{d\omega} &= -\frac{\rho\alpha t^f}{\rho\alpha\left(1-t^f+\omega\right)h'' - \left(\rho\alpha+(1-\alpha)\right)h'} > 0,\\ \frac{dl^f}{dw} &= -\frac{dt^f}{d\omega} < 0,\end{aligned}$$

which implies that she will allocate more time to housework and less time to paid employment when exports increase. We may summarize the above through the following proposition:

Proposition 1 *Let (i) men have comparative advantage in market work and women in housework (see Eq.* (11)*) and (ii) the gender wage gap be positively associated with exports. Then, given the model described by Eqs. (7), (8), (9) and (10), an increase in exports will encourage women to reduce their hours of paid market work and increase their hours of unpaid home production. Men's hours of paid work are unaffected by the variation in exports.*

Proposition 1 suggests that if women have a comparative disadvantage in market work, they will have less incentive to work when exports increase if this leads to a larger gender wage gap. In a developing country such as Indonesia, it is plausible for women to have a comparative advantage in home production, and thus, a comparative disadvantage in market work. For our empirical results to be consistent with the conclusion in Proposition 1, and therefore, for Proposition 1 to be a plausible explanation for the observed negative relationship between exports and female labor force participation, we have to examine if the association between exports and the gender wage gap is positive.[36]

Given that there is a lot of missing data on income is missing in the IFLS, we turn to the Indonesian National Labor Survey in 2007 (Sakernas, 2007), which provides good quality cross-sectional data on individuals' earned income.[37] In Table 10, we report the results on the regression of earned

[36]There are several reasons why this could hold, although testing for the specific mechanism that explains this relationship is beyond the scope of this paper. For example, an increase in exports may lead to skilled biased quality upgrading by exporting firms (Verhoogen, 2008) that favors men who are relatively more skilled than women. It could also lead to more statistical discrimination against women as they are thought to be less committed (Bøler et al., 2015).

[37]We thank Kym Anderson for providing us with access to this database.

income of males or females in 2007 on provincial exports and imports in 2006. We find that exports are positively associated with the earned income of males, but there is no statistically significant relationship between exports and the earned income of females. In this case, an increase in exports is associated with an increase in the gender wage gap which, based on Proposition 1, would yield the conclusion that women would work less in the market and contribute more towards housework as exports increase.

Proposition 1 offers one possible explanation, among others, for why exports appear to have a negative impact on female labor force participation in Indonesia. Another possible explanation to consider is the Sauré & Zoabi (2014) mechanism, which has the ability to generate a negative relationship between exports and female labor forcea participation (see Section 1 for a brief discussion). Note that we cannot test for the plausibility of the Sauré & Zoabi (2014) mechanism as we have limited information on two required pieces of information: a) the movement of workers across sectors and b) whether an increase in exports expands the capital intensive sector (which they assumed to be female intensive) more than the labor intensive sector (which they assumed to be male intensive). That being said, we argue that the Sauré & Zoabi (2014) mechanism is unlikely to hold for Indonesia as it might for the US, which their paper focuses on, as women in Indonesia are typically more lowly skilled than men and because of this, they tend to be in labor intensive sectors such as in the agricultural or services sector. This itself contradicts the required premise of Sauré & Zoabi (2014) that men are in the labor intensive sector and women in the capital intensive sector, which is necessary for their model to generate a negative association between exports and female labor force participation.

Finally, our results that an increase in imports would lead to more female labor force participation is also consistent with this simple model. For example, the model suggests that females would participate more in the labor market when the gender wage gap is narrower. However, from Table 10, we find that an increase in imports is negatively correlated with the income of males but positively correlated with the income of females. This suggests that an increase in imports is negatively associated with the gender wage gap, which according to the model, would encourage more female

labor force participation.

6 Conclusion

In this paper, we study the gender specific effects that exports might have on labor force participation in Indonesia, and though which, we examine the impact of exports on women empowerment. The female labor force participation is an important indicator of women empowerment as employment can help women achieve more economic freedom, independence, and influence within the household. To study the impact of exports on labor force participation, we propose a panel regression approach with Indonesia's IFLS data that deals with identification issues arising primarily from omitted households characteristics and macroeconomics and policy shocks. In particular, our estimation strategy involves constructing the exports exposure index that combines the locational specificity of individuals (i.e. their distance from cities) and information about exports. The export exposure index enables us to use household and province-year fixed effects to purge the confounding influence of unobserved household characteristics and macroeconomic shocks. It also enables us to recover the effect of exports on individuals' labor participation that is purged of these fixed effects.

Our paper shows that the effect of exports on labor force participation varies across gender. In particular, we find that an increase in exports encourages women to allocate time away from paid employment towards unpaid housework or family work along both extensive and intensive margins. However, for men, the effect of exports has turned out to be statistically insignificant. These observations can be explained by our collective household model, where the relative increase in spousal income (following an increase in exports) strengthens the comparative advantage of females in unpaid housework and encourages them to devote more time to home production. Hence, to the extent that empowerment is associated with labor force participation, export orientation may not necessarily lead to greater empowerment of women relative to men.

Table 1: List of variables

Paid/Unpaid Work (Extensive Margin)	
Work	$= 1$ if the individual reports that working was a primary activity (at least one hour) during the past week
Self Work	$= 1$ if the individual is self-employed in his/her primary job
Housework	$= 1$ if the individual reports that housekeeping as a primary activity during the past week
Government Work	$= 1$ if the individual is a government worker in his/her primary job
Salaried Work	$= 1$ if the individual is a salaried employee in his/her primary job
Unpaid Family Work	$= 1$ if the individual reports working for family without pay in his/her primary job
Own_Income	$= 1$ if an individual reports earning his or her own income
Spouse_Income	$= 1$ if an individual reports that his or her spouse earns her or his own income.
Hours of Paid Work (Intensive Margin)	
Hours_Usual	hours of work per week that the individual usually does
Hours_Last_Week	total number of hours of work that the individual did in the last week

Table 2: Summary Statistics

	(1) Females		(2) Males	
	Mean	sd	Mean	sd
Age	41.122	11.252	41.702	10.979
Work	0.8628	0.3439	0.9844	0.1236
Work (in agriculture)	0.3566	0.4790	0.3734	0.4837
Work (in manufacturing)	0.1415	0.3485	0.1165	0.3208
Work (in services)	0.4834	0.4997	0.3402	0.4737
Work (in construction)	0.0077	0.0876	0.0784	0.2688
Housework	0.1925	0.3942	0.0124	0.1107
Self-employed Work	0.4217	0.4938	0.5069	0.5000
Government Work	0.0701	0.2554	0.1027	0.3036
Salaried Work	0.2170	0.4122	0.3283	0.4696
Unpaid Family Work	0.2613	0.4393	0.0237	0.1521
Hours_Usual	37.504	21.00	43.809	17.505
Hours_Last_Week	33.622	22.864	39.676	20.261
Export_Exposure	0.2758	1.7819	0.3257	2.7420
Import_Exposure	0.2673	1.7309	0.3156	2.6827
PGI	0.0269	0.1666	0.0315	0.2490
Obsevations	12784		16116	

Table 3: Probability of Work (Females and Males)

	(1) Females	(2) Males
DEPENDENT VARIABLE:	*Work*	
Export Exposure	-0.2600***	0.0110
	(0.104)	(0.121)
Import Exposure	0.2640**	-0.0108
	(0.106)	(0.136)
Age	0.0501***	0.0297***
	(0.002)	(0.002)
Age Squared	-0.0006***	-0.0004***
	(0.000)	(0.000)
Constant	-0.5130***	0.4040***
	(0.057)	(0.050)
		Observations
Observations	22,357	17,711
R-squared	0.050	0.055
Number of households	9,089	8,047
Household FE	Yes	Yes
Year*Province FE	Yes	Yes

Note: Robust standard errors clustered at the household level are reported in the parentheses. *** p<0.01, **p<0.05, * p<0.1

Table 4A: Probability of earning own income and husband earning own income (reported by females)

	(1)	(2)
DEPENDENT VARIABLE:	*Own_Income*	*Spouse_Income (Husband)*
Export Exposure	-0.0741	-0.0608
	(0.200)	(0.135)
Import Exposure	0.1127	0.1635
	(0.306)	(0.245)
Age	0.0486***	0.0210***
	(0.006)	(0.004)
Age Squared	-0.0006***	-0.0003***
	(0.000)	(0.000)
Constant	(0.115)	(0.083)
Observations	12,372	12,371
R-squared	0.032	0.044
Number of Households	6,789	6,789
Household FE	Yes	Yes
Year*Province FE	Yes	Yes

Note: Robust standard errors clustered at the household level are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4B: Probability of earning own income and wife earning own income (reported by males)

	(1)	(2)
DEPENDENT VARIABLE:	*Own_Income*	*Spouse_Income (Wife)*
Export Exposure	0.1155	-0.6460**
	(0.129)	(0.266)
Import Exposure	-0.1483	0.8600**
	(0.249)	(0.408)
Age	0.0238***	0.0251***
	(0.005)	(0.007)
Age Squared	-0.0003***	-0.0002***
	(0.000)	(0.000)
Constant	0.5153***	-0.2144
	(0.100)	(0.142)
Observations	11,141	11,133
R-squared	0.031	0.037
Number of Households	6,379	6,378
Household FE	Yes	Yes
Year*Province FE	Yes	Yes

Note: Robust standard errors clustered at the household level are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5A: Probability of work by sector (Females)

	(1) Agriculture	(2) Manufacturing	(3) Services
DEPENDENT VARIABLE:		*Work*	
Export Exposure	-0.1054***	-0.1344***	-0.0451
	(0.032)	(0.050)	(0.089)
Import Exposure	0.0906**	0.1335***	0.0708
	(0.039)	(0.049)	(0.089)
Age	0.0167***	0.0027*	0.0339***
	(0.002)	(0.002)	(0.002)
Age Squared	-0.0002***	-0.0001***	-0.0004***
	(0.000)	(0.000)	(0.000)
Constant	-0.1851***	0.0717**	-0.3391***
	(0.039)	(0.031)	(0.049)
Observations	22,357	22,357	22,357
R-squared	0.046	0.013	0.036
Number of Households	9,089	9,089	9,089
Household FE	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes

Note: Robust standard errors clustered at the household level are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5B: Probability of work by sector (Males)

	(1) Agriculture	(2) Manufacturing	(3) Services	(4) Construction
DEPENDENT VARIABLE:	*Work*			
Export Exposure	0.0307	0.0005	0.0251	0.0621*
	(0.030)	(0.052)	(0.074)	(0.036)
Import Exposure	-0.0360	-0.0162	-0.0106	-0.0789*
	(0.032)	(0.059)	(0.080)	(0.045)
Age	0.0020	-0.0023	0.0192***	0.0052***
	(0.003)	(0.002)	(0.003)	(0.002)
Age Squared	0.0000	-0.0000	-0.0002***	-0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.2531***	0.3610***	-0.0247	-0.0715*
	(0.062)	(0.050)	(0.069)	(0.038)
Observations	17,711	17,711	17,711	17,711
R-squared	0.028	0.021	0.013	0.011
Number of Households	8,047	8,047	8,047	8,047
Household FE	Yes	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the household level are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6A: Probability of work by types of work (Females)

	(1)	(2)	(3)	(4)	(5)
	Types of Work				
DEPENDENT VARIABLE:	*Self Work*	*Housework*	*Government Work*	*Salaried Work*	*Unpaid Family Work*
Export Exposure	-0.1144	0.1927*	0.0338	-0.2449***	0.0312
	(0.086)	(0.102)	(0.027)	(0.070)	(0.072)
Import Exposure	0.1334	-0.1887*	-0.0327	0.2506***	-0.0448
	(0.092)	(0.104)	(0.032)	(0.070)	(0.075)
Age	0.0330***	-0.0302***	0.0062***	0.0056***	0.0068***
	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)
Age Squared	-0.0003***	0.0003***	-0.0001***	-0.0001***	-0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.5168***	1.2287***	-0.0562***	0.0804**	0.0489
	(0.048)	(0.058)	(0.019)	(0.041)	(0.038)
Observations	22,357	22,357	22,357	22,357	22,357
R-squared	0.037	0.035	0.015	0.028	0.030
Number of Households	9,089	9,089	9,089	9,089	9,089
Household FE	Yes	Yes	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the household level are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6B: Probability of work by types of work (Males)

	(1)	(2)	(3)	(4)	(5)
	Types of Work				
DEPENDENT VARIABLE:	*Self Work*	*Housework*	*Government Work*	*Salaried Work*	*Unpaid Family Work*
Export Exposure	0.0282	0.0102	0.0032	0.0323	-0.0232
	(0.063)	(0.012)	(0.035)	(0.065)	(0.022)
Import Exposure	-0.0225	-0.0075	-0.0124	-0.0328	0.0195
	(0.065)	(0.014)	(0.040)	(0.073)	(0.022)
Age	0.0187***	-0.0027**	0.0205***	-0.0101***	-0.0089***
	(0.004)	(0.001)	(0.002)	(0.003)	(0.002)
Age Squared	-0.0001***	0.0000**	-0.0002***	0.0000	0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.1441*	0.0724***	-0.3159***	0.7332***	0.2546***
	(0.075)	(0.025)	(0.036)	(0.068)	(0.036)
Observations	17,711	17,711	17,711	17,711	17,711
R-squared	0.037	0.019	0.033	0.097	0.020
Number of Households	8,047	8,047	8,047	8,047	8,047
Household FE	Yes	Yes	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the household level are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7A: Probability of work conditional on previous year work status (Females)

	(1)	(2)
Worked in the previous year?	No	Yes
DEPENDENT VARIABLE:	*Work*	
Export Exposure	3.890	-0.3970*
	(4.428)	(0.205)
Import Exposure	-4.798	0.5200
	(9.759)	(0.332)
Age	0.0344	0.0339***
	(0.043)	(0.006)
Age Squared	-0.0004	-0.0004***
	(0.001)	(0.000)
Constant	-0.0617	0.0864
	(1.398)	(0.134)
Observations	1,315	8,275
R-squared	0.130	0.031
Number of Households	1,208	5,207
Household FE	Yes	Yes
Year*Province FE	Yes	Yes

Note: Robust standard errors clustered at the household level are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7B: Probability of work conditional on previous year work status (Males)

	(1)	(2)
Worked in the previous year?	No	Yes
DEPENDENT VARIABLE:	*Work*	
Export Exposure	488.22	-0.1508
	(0.000)	(0.097)
Import Exposure	-994.60	0.2011
	(0.000)	(0.125)
Age	0.2605	0.0064**
	(0.000)	(0.003)
Age Squared	-0.0030	-0.0001**
	(0.000)	(0.000)
Constant	289.67	0.8447***
	(0.000)	(0.058)
		O
Observations	407	10,964
R-squared	0.621	0.006
Number of Households	383	6,332
Household FE	Yes	Yes
Year*Province FE	Yes	Yes

Note: Robust standard errors clustered at the household level are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 8A: Hours of work in the previous week (Females)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Types of Work							
DEPENDENT VARIABLE:	*any work*	*salary work*	*housework*	*self work*	*unpaid family work*	*agriculture*	*manufacturing*	*service*
Export Exposure	-19.22*	-39.58*	110.0	-29.21	88.50***	376.2	13.15	-28.65**
	(10.0)	(21.2)	(219.1)	(20.9)	(18.0)	(272.3)	(22.0)	(11.3)
Import Exposure	19.55**	39.36*	-104.19	34.67	-81.37***	-269.04	-20.94	28.32**
	(9.73)	(20.5)	(197.8)	(21.5)	(17.8)	(291.8)	(23.5)	(11.1)
Age	0.6236***	-0.3165	0.0088	0.8106*	0.3801	0.8448***	-0.4342	1.057***
	(0.225)	(0.523)	(0.625)	(0.461)	(0.441)	(0.287)	(0.666)	(0.368)
Age squared	-0.0079***	0.0011	-0.0014	-0.0091*	-0.0052	-0.0097***	0.0059	-0.0113***
	(0.003)	(0.007)	(0.007)	(0.005)	(0.005)	(0.003)	(0.008)	(0.004)
Constant	26.06***	47.36***	20.40	18.52*	23.86**	5.244	42.94***	16.49**
	(4.76)	(10.6)	(15.9)	(10.4)	(9.42)	(6.47)	(13.4)	(7.72)
								Observations
Observations	11,065	2,781	2,483	5,424	3,348	4,567	1,815	6,213
R-squared	0.018	0.059	0.156	0.019	0.105	0.100	0.063	0.021
Number of Households	6,010	1,987	2,162	3,460	2,285	2,704	1,330	3,748
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the household level are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 8B: Hours of work in the previous week (Males)

	(1)	(2)	(4)	(5)	(6)	(7)	(8)
	Types of Work						
DEPENDENT VARIABLE:	*any work*	*salaried work*	*self work*	*construction*	*agriculture*	*manufacturing*	*service*
Export Exposure	-2.798	-12.63*	-8.849	-1.210	13.97	-3.262	-13.03*
	(4.43)	(7.10)	(20.67)	(16.82)	(120.5)	(9.12)	(7.16)
Import Exposure	3.000	13.22*	10.84	7.605	0.6931	2.385	13.46*
	(4.85)	(7.02)	(20.90)	(15.79)	(112.2)	(11.6)	(7.15)
Age	0.5401***	0.5640	0.7684***	-0.3385	0.6589**	0.0077	0.7140*
	(0.171)	(0.395)	(0.267)	(0.723)	(0.292)	(0.659)	(0.408)
Age Squared	-0.0083***	-0.0092*	-0.0110***	0.0024	-0.0090***	-0.0021	-0.0082*
	(0.002)	(0.005)	(0.003)	(0.009)	(0.003)	(0.008)	(0.005)
Constant	36.24***	37.13***	28.55***	50.76***	24.69***	47.12***	27.011***
	(3.46)	(7.72)	(5.88)	(15.02)	(6.29)	(13.24)	(8.39)
Observations	15,935	5,328	8,198	1,267	6,042	1,885	5,512
R-squared	0.025	0.037	0.040	0.121	0.049	0.072	0.021
Number of Households	7,644	3,568	4,575	924	3,353	1,420	3,504
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the household level are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 9A: Usual hours of work (Females)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Types of Work							
DEPENDENT VARIABLE:	*any work*	*salaried work*	*housework*	*self work*	*unpaid family work*	*agriculture*	*manufacturing*	*service*
Export Exposure	-21.63**	-44.11**	99.82	-22.65	79.26***	-36.95	-6.109	-24.42**
	(9.74)	(20.25)	(249.2)	(17.57)	(19.63)	(210.1)	(22.04)	(10.89)
Import Exposure	22.66**	43.19**	-99.13	29.14	-73.06***	91.39	-9.540	24.26**
	(9.51)	(19.3)	(229.6)	(18.28)	(19.76)	(216.5)	(24.91)	(10.63)
Age	0.6864***	0.1125	0.4850	0.7404*	0.6909*	0.7047***	-0.2452	1.155***
	(0.209)	(0.493)	(0.634)	(0.438)	(0.406)	(0.265)	(0.622)	(0.349)
Age Squared	-0.0088***	-0.0042	-0.0088	-0.0089*	-0.0094**	-0.0087***	0.0032	-0.0125***
	(0.002)	(0.006)	(0.007)	(0.005)	(0.005)	(0.003)	(0.008)	(0.004)
Constant	27.94***	43.37***	21.59	24.31**	21.92**	17.23***	45.07***	16.94**
	(4.46)	(10.11)	(15.85)	(10.00)	(8.80)	(5.92)	(12.52)	(7.305)
								Observations
Observations	11,041	2,777	2,465	5,400	3,344	4,560	1,812	6,190
R-squared	0.014	0.058	0.135	0.016	0.067	0.049	0.065	0.022
Number of Households	6,002	1,984	2,151	3,452	2,284	2,701	1,327	3,743
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the household level are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 9B: Usual hours of work (Males)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Types of Work						
DEPENDENT VARIABLE:	*any work*	*salaried work*	*self work*	*construction*	*agriculture*	*manufacturing*	*service*
Export Exposure	-0.7848	-2.628	-8.319	15.68	-114.01**	7.897	-2.444
	(3.90)	(4.35)	(19.53)	(18.46)	(47.35)	(9.62)	(4.83)
Import Exposure	0.6077	1.744	11.27	-11.50	117.49***	-9.115	1.403
	(4.25)	(4.74)	(19.95)	(16.93)	(43.31)	(11.50)	(5.31)
Age	0.5394***	0.7333**	0.8335***	0.8001	0.7421***	-0.5223	0.6808*
	(0.148)	(0.332)	(0.236)	(0.620)	(0.237)	(0.539)	(0.374)
Age Squared	-0.0077***	-0.0107**	-0.0108***	-0.0094	-0.0091***	0.0050	-0.0081*
	(0.002)	(0.004)	(0.003)	(0.008)	(0.003)	(0.006)	(0.004)
Constant	38.49***	37.24***	28.08***	31.63**	26.02***	58.21***	31.95***
	(3.01)	(6.47)	(5.09)	(12.82)	(4.95)	(11.04)	(7.69)
							Observations
Observations	15,907	5,313	8,186	1,266	6,027	1,883	5,504
R-squared	0.013	0.034	0.015	0.125	0.022	0.094	0.015
Number of Households	7,634	3,558	4,568	923	3,344	1,418	3,499
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the household level are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 10: Cross-sectional regression of male and female wages on exports and imports at the province level

	(1)	(2)
DEPENDENT VARIABLE:	*Male's wage*	*Female's wage*
log(*Export*)	0.217***	-0.0058
	(0.016)	(0.032)
log(*Import*)	-0.186***	0.153***
	(0.015)	(0.028)
Constant	13.80***	9.081***
	(0.073)	(0.14)
Observations	115,100	115,100
R-squared	0.002	0.002

Note: Robust standard errors are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1. The provincial export and import data comes from 2006. The wage data comes from 2007.

Figure 1: Jakarta in relation to other cities in Indonesia

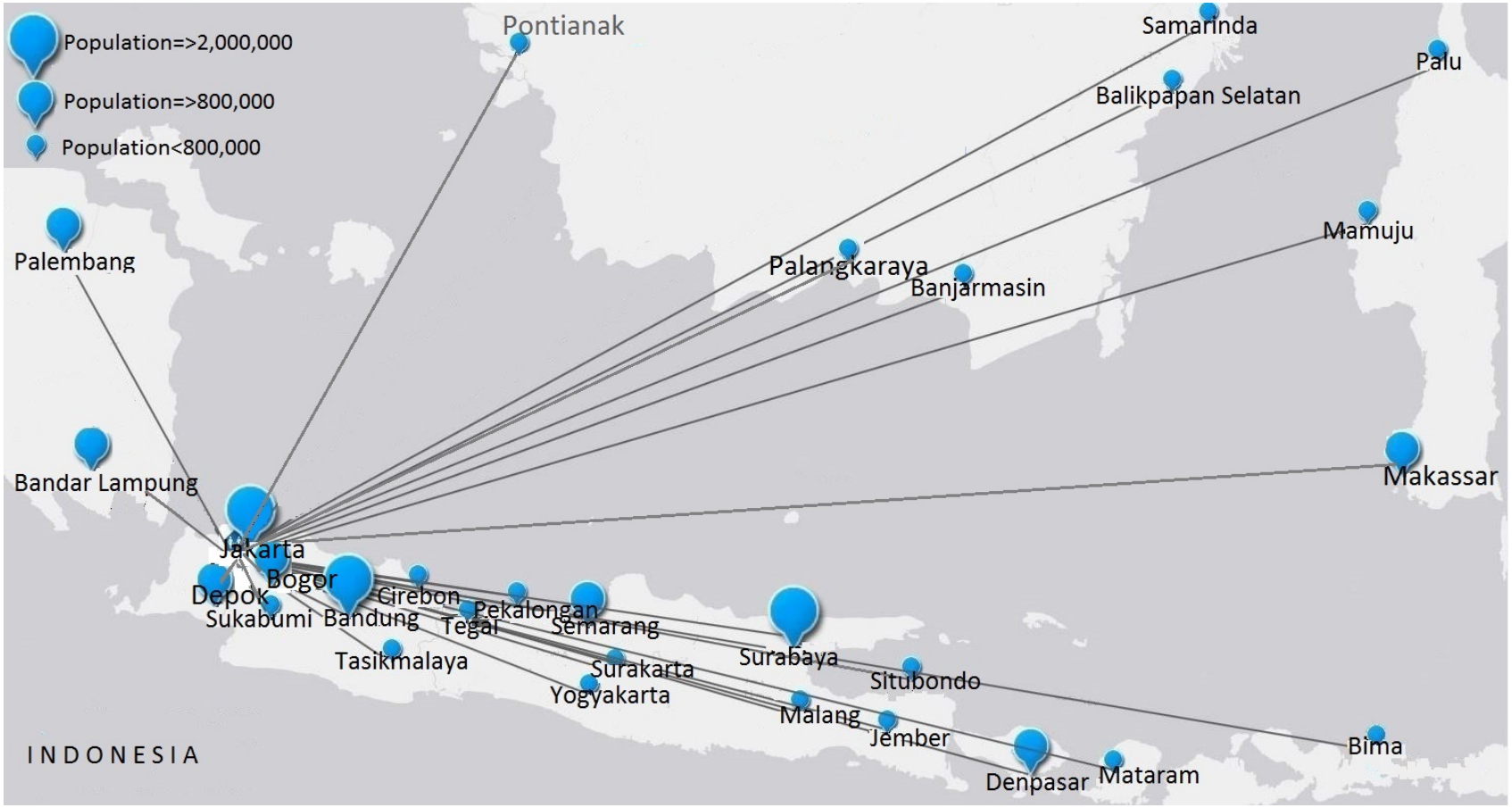
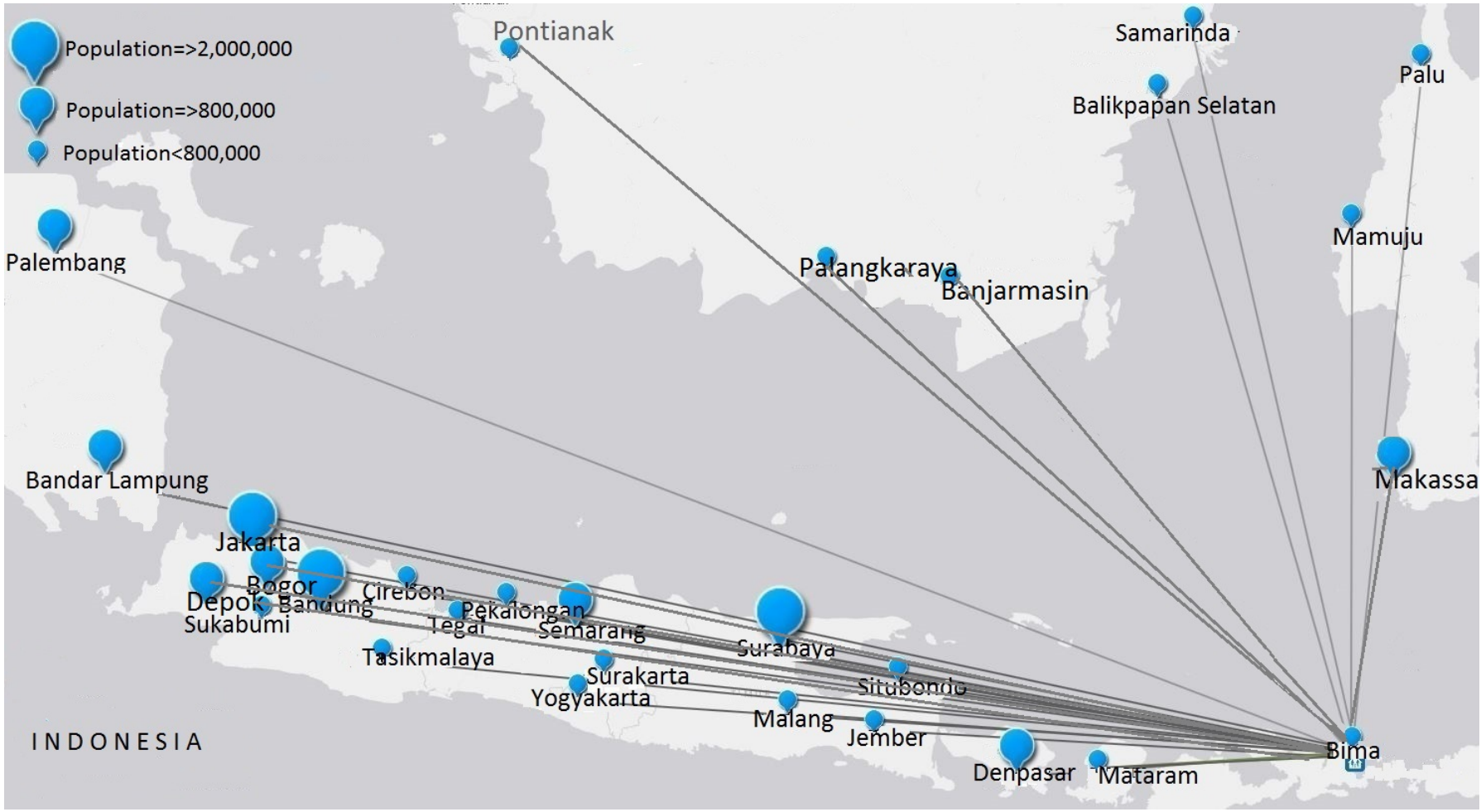


Figure 2: Bima in relation to other cities in Indonesia



References

[1] Agrawal, N. (1996). The benefits of growth for Indonesian workers. *World Bank Policy Research Working Paper No. 1637*.

[2] Amiti, M., & Davis, D. R. (2012). Trade, firms, and wages: Theory and evidence. *Review of Economic Studies* 79: 1–36.

[3] Amiti, M., & Cameron, L. (2012). Trade liberalization and the wage skill premium: Evidence from Indonesia. *Journal of International Economics* 87: 277–287.

[4] Anderson, S. & Eswaran, M. (2009) What determines female autonomy? Evidence from Bangladesh. *Journal of Development Economics* 90: 179–191.

[5] Atkin, D. (2009). Working for the future: Female factory work and child health in Mexico. Unpublished Manuscript, Yale University.

[6] Başlevent, C., & Onaran, Ö. (2004). The effect of export-oriented growth on female labor market outcomes in Turkey. *World Development* 32: 1375–1393.

[7] Basri, M. C., & Hill, H. (2004). Ideas, interests and oil prices: the political economy of trade reform during Soeharto's Indonesia. *The World Economy* 27: 633–655.

[8] Beaman, L., Duflo, E., Pande, R. & Topalova, P. (2012). Female leadership raises aspirations and educational attainment for girls: A policy experiment in India. *Science* 335: 582–586.

[9] Becker, G. S. (2010). The Economics of Discrimination. Chicago: The University of Chicago Press.

[10] Berik, G., Rodgers, Y. V. D. M., & Zveglich, J.E. (2004). International trade and gender wage discrimination: Evidence from East Asia. *Review of Development Economics* 8: 237–254.

[11] Blundell, R., Chiappori, P. A., Magnac, T., & Meghir, C. (2007). Collective labour supply: Heterogeneity and non-participation. *Review of Economic Studies* 74: 417–445.

[12] Bøler, E. A., Javorcik, B. S. & Ulltveit-Moe, K.H. (2015). Globalization: A woman's best friend? Exporters and the gender wage gap. Centre for Economic Policy Research. Discussion Paper No. 10475.

[13] Brown, P.H., Park, A. (2002). Education and poverty in rural China. *Economics of Education Review* 21: 523-541.

[14] Browning, M., Chiappori, P. A., & Weiss, Y. (2014). *Economics of the Family*. Cambridge: Cambridge University Press.

[15] Bussmann, M. (2009). The effect of trade openness on women's welfare and work life. *World Development* 37, 1027-1038.

[16] Cameron, L. (2002). Women in the labor market: During and post-Crisis. In Indonesia Assessment, ed. K. M. Robinson & S. Bessell, 144–157. Institute of Southeast Asian Studies.

[17] Deichmann, U., Lall, S. V., Redding, S. J., & Venables, A. J. (2008). Industrial location in developing countries. *The World Bank Research Observer* 23: 219–246.

[18] Do, Q. T., Levchenko, A. A. & Raddatz, C. (2016) Comparative advantage, international trade, and fertility, *Journal of Development Economics* 119: 48–66.

[19] Duflo, E. (2012). Women empowerment and economic development. *Journal of Economic Literature* 50: 1051–1079.

[20] Ederington, J., Minier, J. & Troske, K. (2009). Where the Girls Are: Trade and Labor Market Segregation in Colombia. IZA Discussion Papers 4131, Institute for the Study of Labor (IZA).

[21] Friedrich Ebert Stiftung (2009) Trade - A driving force for jobs and women's empowerment? Focus on China and India. *FES Briefing Paper No. 7*.

[22] Gaddis, I. & Pieters, J. (2016). The gendered labor market impacts of trade liberalization: Evidence from Brazil. *Journal of Human Resources*, forthcoming.

[23] Helpman, E. (1998). The Size of Regions. In *Topics in Public Economics: Theoretical and Applied Analysis*, ed. D. Pines, E. Sadka & I. Zilcha, 33–54. Cambridge: Cambridge University Press.

[24] Hill, H., Resosudarmo, B. P., & Vidyattama, Y. (2008). Indonesia's changing economic geography. *Bulletin of Indonesian Economic Studies* 44: 407-435.

[25] Hossain, N. (2011). Exports, equity and empowerment: The effects of readymade garments manufacturing employment on gender equality in Bangladesh. World Bank World Development Report 2012.

[26] International Labour Office (2010). Women in labour markets: Measuring progress and identifying challenges.

[27] International Monetary Fund (2013). Women, work, and the economy: Macroeconomic gains from gender equity. IMF Staff Discussion Note, SDN/13/10.

[28] Jensen, T. (2010). The (perceived) returns to education and the demand for schooling. *Quarterly Journal of Economics* 125: 515–548.

[29] Jensen, R. (2012). Do labor market opportunities affect young women's work and family decisions? Experimental evidence from India. *Quarterly Journal of Economics* 127: 753–792.

[30] Juhn, C., Ujhelyi , G. & Villegas-Sanchez, C. (2014). Men, women, and machines: How trade impacts gender inequality. *Journal of Development Economics* 106: 179–193.

[31] Kis-Katos, K., & Sparrow, R. A. (2015). Poverty, labour markets and trade liberalization in Indonesia. *Journal of Development Economics* 117: 94–106.

[32] Lim, L. L. (2009). Female labour force participation, Completing the Fertility Transition, 193–212. *United Nations Publications*.

[33] Munshi, K., & Rosenzweig, M. (2006). Traditional institutions meet the modern world: Caste, gender, and schooling choice in a globalizing economy. *American Economic Review* 96: 1225–1252.

[34] Neumayer, E., & De Soysa, I. (2007). Globalisation, women's economic rights and forced labour. *The World Economy* 30: 1510–1535.

[35] Neumayer, E., & De Soysa, I. (2011). Globalization and the empowerment of women: an analysis of spatial dependence via trade and foreign direct investment. *World Development* 39: 1065–1075.

[36] Oostendorp, R. H. (2009). Globalization and the gender wage gap. *The World Bank Economic Review* 23: 141–161.

[37] Ozler, S. (2000). Export orientation and female share of employment: Evidence from Turkey. *World Development* 28: 1239–1248.

[38] Potrafke, N., & Ursprung, H. W. (2012). Globalization and gender equality in the course of development. *European Journal of Political Economy* 28: 399–413.

[39] The Probe Team (1999). *Public Report on Basic Education in India*, Oxford: Oxford University Press.

[40] Paul-Majumder, P., & Begum, A. (2000). The gender imbalances in the export oriented garment industry in Bangladesh. *The World Bank, Development Research Group/Poverty Reduction and Economic Management Network.* Washington, DC.

[41] Qian, N. (2008). Missing women and the price of tea in China: The effect of sex-specific earnings on sex imbalance. *Quarterly Journal of Economics* 123: 1251–1285.

[42] Redding, S. J., & Sturm, D. M. (2008). The costs of remoteness: Evidence from German division and reunification. *American Economic Review* 98: 1766–1797.

[43] Redding, S., & Venables, A. J. (2004). Economic geography and international inequality. *Journal of international Economics* 62: 53–82.

[44] Sauré, P. & Zoabi, H. (2014). International trade, the gender wage gap and female labor force participation, *Journal of Development Economics* 111: 17–33.

[45] Schaner, S., & Das, S. (2016). Female labor force participation in Asia: Indonesia country study. *Asian Development Bank Economics Working Paper Series* No. 474.

[46] Schultz, T.P. (2002). Why governments should invest more to educate girls. *World Development* 30: 207–225.

[47] Strauss, J., Witoelar, F., Sikoki, B., & Wattie, A. M. (2009). The fourth wave of the Indonesia Family Life Survey: Overview and field report. RAND Labor and Population Working Paper WR-675/1-NIA/NICHD. Santa Monica, CA: RAND.

[48] Topalova, P. (2007). Trade liberalization, poverty and inequality: Evidence from Indian districts, in *Globalization and Poverty*, National Bureau of Economic Research: 291–336.

[49] UNCTAD Secretariat (2016). Trade as a tool for the economic empowerment of women, Expert Meeting in Geneva, May 23-24.

[50] Verhoogen, E. (2008). Trade, quality upgrading and wage inequality in the Mexican manufacturing sector. *Quarterly Journal of Economics* 123: 489–530.

[51] World Bank (1993). *The East Asian Miracle: Economic Growth and Public Policy*, Oxford: Oxford University Press.

[52] World Bank (2000). *Can Africa Claim the 21st Century?* Washington: World Bank Publications.