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Export Exposure and Gender Specific Work Participation in Indonesia*

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Abstract

The paper examines if exports have unequal influence on the work decisions of men and women using household panel data from the Indonesian Family Life Survey. We construct a novel measure – the export exposure index – which allows us to estimate the relationship between exports and the work decisions of individuals even after controlling for household and province-year fixed effects. Our regression analysis shows that an increase in exports does not have a statistically significant effect on men, but encourages women to allocate time away from paid employment towards unpaid house or family work. These results are consistent with our simple theoretical model which predicts that the relative increase in spousal income (following an increase in export exposure) strengthens females' comparative advantage in unpaid housework and allows them to devote more time to home production.

Keywords: Exports, Gender, Labor Force Participation.

JEL classifications: O12, F63.

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1 Introduction

On March 11, 2010, the U.S. President Barack Obama signed an executive order on the National Export Initiative (NEI) that called for doubling the U.S. exports in five years to create 2 million new jobs. This event, like many others, reflects a popular thinking in trade policy circles that exports can create employment. Yet, on the issue of gender representation in the labor force, it remains unclear if the rise in exports will help women achieve greater parity in participation rates as men. This issue has particular relevance for developing countries as in many of them, women are still less likely than men to participate in the labor force.[1] Furthermore, there is evidence that women participation rates may not always follow in the same direction as countries' level of development in general, and exports, in particular.[2] Therefore, even though a rise in exports may increase the overall employment in developing countries, how the employment of women and men is affected by exports and whether the response of employment varies with gender remain unclear.

In this paper, we estimate the effect that an increase in exports have on women's and men's labor force participation by focusing on Indonesia as example of a developing country. Indonesia, a so-called "Asian Tiger Cub", is one of the largest export-oriented emerging economies in the world. With its Indonesian Family Life Survey (IFLS), it also has one of the most comprehensive household panel datasets of any developing country. That being said, the question of how exports might affect an individual's labor force participation is still a difficult issue to address despite the availability of good household panel data such as the IFLS. Firstly, because export intensification is a macroeconomic phenomenon, its effect on individuals may be confounded by the effects of unobserved regional and global macroeconomic shocks. Secondly, the difficulty of identifying the effect of exports is also compounded by the fact that decisions to work are often jointly determined within a household (e.g. between husband and wife) with behaviors, norms, and abilities that are unobservable.

[1] See a World Bank article ”Women are less likely than men to participate in the labor market in most countries” available on http://data.worldbank.org/news/women-less-likely-than-men-to-participate-in-labor-market

[2] According to the World Bank Gender Equality Database, women's labor participation rates tend to follow a U-shape with respect to country's per capita income.

To estimate the effect of exports on labor force participation, we construct a novel measure called the *export exposure index* and look at how it is related with labor force participation. The export exposure index contains information about how exposed an individual is to exports. Therefore, unlike the value of exports, the index has *both* cross-sectional and time variation. This allows us to employ household and province-year fixed effects to eliminate all confounding household characteristics and regional and macroeconomic shocks described above. To measure exposure, the index uses the idea that exporting activities are primarily concentrated in large population centers; hence, an individual who is nearer to larger cities will be more exposed to macroeconomic activities such as exports. This notion of exposure to cities in a given province is summarized by a score, called the *Population Gravity Index* (PGI), which measures an individual's proximity to all cities in this province weighted by the size (i.e., population) of these cities. To construct the export exposure index – our main explanatory variable – we interact the PGI score for each province with exports in that province and then aggregate this interaction term over all provinces, so that the influence of exports will be amplified for those who are within or near large cities. This amplification mechanism, which is based on the location specificity of individuals, will then make it possible for us to estimate the effect of exports on individuals' participation even after controlling for household and province-year dummies.

Our empirical analysis considers labor force participation along both extensive margin (i.e., whether a person participates in work) and intensive margin (i.e., the hours of work an individual puts in). We find that exports do not have a statistically significant effect on either margin of work by men, implying that men's labor supply is inelastic. However, for women, we find that an increase in exports could reduce labor force participation and increase household and unpaid family work along both extensive and intensive margins. Therefore, while it might be reasonable to hypothesize that exports may increase employment, our study shows that the converse may be true for women.

To understand how exports may affect labor force participation differently for women and men, we construct a simple model to study how this result can arise. Our model focuses on a household, consisting of a man and woman, that consumes a market good (which the household purchases using earned labor income) and a household good (which is produced using only household labor). We find that if men have a comparative advantage in labor market (i.e., men earn higher wages than women) and women in the household good, then men will devote all their time to working for a wage and thus have an inelastic labor supply with respect to exports. Moreover, if an increase in exports raises the relative wages of men over women in a way that preserve their respective comparative advantages, this relative increase in income for men (resulting from more exports) will encourage women to substitute their time away from market employment towards home production. The key mechanism, which enables our model to explain our empirical results about women's participation, is the rise in the relative wage of men with exports. In the case of Indonesia, there is some limited evidence that such positive relationship between relative wages and exports is present.[3]

Our paper is related to the expanding literature on gender gap, female empowerment and economic development in two ways.[4] First, the existing literature, which relies on cross-country or labor survey data, has found mixed evidence on whether globalization can lead to higher labor participation rates of women in developing countries. The studies which use cross-country data suggest that, on one hand, 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 (Ursprung, 2012; Neumayer and Soysa, 2007). On the other hand, there is also evidence that these positive effects of globalization are obtained only for samples of middle-income and rich countries (Oostendorp, 2009; Neumayer and Soysa, 2011). The literature which uses labor survey data suggests that globalization induces competitive effects on gender discrimination along the lines of Becker, 2010 (e.g., Berik et al, 2004, Ederington et al, 2009; Ozler, 2000). However, there is also evidence that these pro-competitive effects of globalization are limited and occur either only in blue-collar occupations (Juhn et al, 2014), or only for unmarried women (Baslevent and Onaran, 2004). Our paper contributes to this important issue by providing new empirical evidence based on the analysis of the panel household data.

[3]This may occur if women are more heavily represented in the informal sector (e.g., unpaid family workers or services) while men in the formal sector. In Indonesia, females are most likely to work as unpaid family workers, accounting for 36.9% of employed females in 2006 (OECD country report, Indonesia).

[4]See Duflo (2012) for a review of this literature.

Second, our paper offers a novel direct measure of globalization (e.g. exports) exposure that is compatible for studies using large scale microeconomic (household) data. Such an approach may potentially be useful for studies where quasi-natural or randomized field experiments, which have been employed in household panel studies (e.g. Munshi and Rosenzweig, 2006; Atkin, 2009; Jensen, 2012), are infeasible or unavailable. To construct our export exposure index, one only needs information about the individual's location to cities to generate individual specificity in globalization exposure, which is likely to be available with household panel data.

The rest of the paper is organized as follows. Section 2 provides an overview of Indonesia. Section 3 describes data, key variables and empirical model. Section 4 discusses the results. Section 5 provides a conceptual framework for our empirical analysis. Finally, Section 6 concludes.

2 Indonesia: An Overview

For various reasons, Indonesia provides a good context for a study of how exports might affect the employment of women and men in a developing country. Firstly, exports have played an important part in transforming Indonesia's economy. Historically, the Indonesian economy was dominated by the agricultural sector, with agricultural output alone contributing to more than 33% of GDP in 21 of the 26 provinces in 1970s.[5] 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,[6] it managed to recover rapidly as reflected by the 15% increase in exports it posted over the pre-crisis (1990–96) average export value just merely two years after the crisis.

Secondly, the Indonesian government have been trying to put in place policies that aim to

[5]Currently, the economic focus on agriculture is significantly reduced: in 2004, the eight provinces where agriculture still accounts for at least 33% of GDP are either the country's poorest or with a very strong comparative advantage in this sector. See Basri and Hill (2004).

[6]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.

generate economic opportunities for women. Such policies include 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, compulsory education for children to reduce the gender gap at schools, etc. [7,8] 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 participate rate of women fell within each age group and from 60% to 54% on average, while the average participation rate of men stayed roughly constant at 87%.[9] 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 with large economic differences across provinces.[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). Such geographical and economic variation is very helpful from the perspective of obtaining sharper econometric estimates.

Finally, Indonesia has arguably the most comprehensive household panel data, the Indonesian Family Life Survey, 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. These issues will be discussed further in Sections 3.3 and 3.4.

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

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

[9]See International Labour Organization (2009).

[10]Indonesia is the world's largest archipelagic state with its 13,000 islands which are divided in 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. The first wave of survey sample represented about 83% of the Indonesian population living in 13 of the country's 26 provinces at that time. From the IFLS, we primarily use information on individuals' labor supply, gender and marital status.[13]

Our next data source 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 documents of export-import declaration issued by the Custom and Excise Offices. We also obtain information on cities population size from Badan Pusan Statistik (Statistics Indonesia). Finally, we use ArcGIS to construct the geodesic distance between cities and the district where the household is located. This information will then be used to construct our export exposure index described below.

3.2 Key Variables

Export Exposure Index The main explanatory variable in this paper is the export exposure index that measures the exposure to export in time t, experienced by individual i living in household h and located in district d. This index, denoted by $Export\_Exposure$, is constructed in two steps. First, for each province j, we construct the so-called *Population Gravity Index* that mea-

[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]We do not use data from the first wave IFLS1 as the format of the employment questions is different in IFLS1 and the subsequent waves.

sures exposure to cities, which is based on an individual's proximity to cities (in province j) weighted by the size (i.e. population) of these cities. Given that exporting activities are primarily concentrated in large population centers, the PGI score captures the idea that an individual will be more exposed to the exports of a province the nearer she is to large cities of the province. Second, we interact the individual's PGI score associated with province j by that province's exports to construct an export exposure index at the individual-province pair level. After which, we construct $Export\_Exposure$ by aggregating this interaction term over all provinces to obtain an aggregated measure of export exposure.

Step 1: Computing the Population Gravity Index

To measure exposure to cities in province j, we construct the PGI score, which contains two terms: (i) the distance of a household from major cities in province j and (ii) the size (i.e., population) of these cities. The PGI score conveys the idea that cities with larger populations have greater market potential. Hence, larger cities will exert more force (i.e., gravity) on households than smaller cities would, although this effect will be more weakly felt by households located further away from cities in general.

Therefore, the PGI score is positively related to the size of cities and inversely related to the distance of households from cities. Such a measure of exposure is reminiscent of measures of market access in the economic geography literature. One example of which comes from Redding and 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 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 household h located in district d based on

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

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_{hdkj} is the geodesic distance between city k in province j to the household located in district d.[14]

[14]Note that PGI score is computed in relation to any province, not only the province where the individual resides,

The data on cities and their population size is from 2010 Population Census collected by Badan Pusan Statistik. Note that as the data on cities population size is available only for 2010, our PGI score is time-invariant. In our calculations of the PGI scores, we include all cities located in each province reported in the Badan Pusat Statistik data.[15] For example, the Java province consists of Jakarta, the capital city, as well as large cities such as Bogor and Depok.

The PGI score expressed by eq. (1) captures the notion of market exposure: the larger the PGI score, the more exposed a household is to markets in cities. There are two factors influencing the PGI score. First, in its numerator, we have city population, which captures the idea that cities that are larger will have a greater influence on the household. In its denominator, we have distance between the household and the city, which captures the idea that the city's influence on the household will weaken if the household is located further away from it.

Intuitively, the construction of the PGI score in eq. (1) can be visualized from Figures 1 and 2. Let us consider a household in Jakarta, the capital city of Indonesia (Figure 1), and in Bima, a small city in the province of West Nusa Tenggara (Figure 2). For a household in Jakarta (or Bima), we draw the geodesic distances between Jakarta (or Bima) and other cities in Indonesia, where larger (smaller) cities are represented in the map by a larger (smaller) marker. Notice that Bima is in a more remote location than Jakarta is, in the sense that it is far away from major cities while Jakarta is a major city itself. Hence, individuals living in Bima will have a smaller PGI score than those in Jakarta.

There are three additional items to be discussed in how we construct the PGI score. First, for the sake of presentation, we use city population in millions for the numerator of the PGI score. If we instead use the actual population, the coefficient on the export exposure index (see eq. (4) below) will be too small (i.e. have too many leading zeros in the decimal) and is cumbersome to report in tables.[16] Second, in the denominator of the PGI score, we add the value of 1 to geodesic

hence, district d does not have to be located in province j.

[15]There are a total of 95 cities in Indonesia in 2010 with Jakarta being the largest and Sabang in North Sumatra (with population of 28,454) being the smallest. According to Badan Pusat Statistik, a city is defined as an area with non agricultural economic activities which has its own local government.

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

distances. Without doing so, division by zero becomes possible for households located within cities. Finally, the term $(1 + D_{dkj})$ in the denominator is raised to the power of two to allow for the influence of cities on households to diminish more quickly as distance increases. However, it should be emphasized that the direction of the effect of exports on labor participation is not affected whether or not we use $(1 + D_{dkj})$ or $(1 + D_{dkj})^2$ as the denominator.[17]

Although the PGI score is not a complicated object to compute, the geodesic distances between households and cities required for its computation are somewhat difficult to obtain. This difficulty stems from the fact that the exact location of households cannot be determined from the IFLS. Rather, the IFLS only provides the postal code of the district where the household resides. Given this constraint, we measure the location of a household by the centroid of the district where the household is in, and compute the geodesic distance from that household to some city as the distance between the district centroid (associated with the household) and the city centroid. This is done by first calculating the location of the district and city centroids by their latitudes and longitudes to obtain the geodesic distance measured in degrees (i.e. in the geographic coordinates). Then, to convert these distances into kilometers, which is what we use as D_{dkj} in the PGI score, we convert the geographic coordinate system to an appropriate projected coordinate system (i.e. equidistant cylindrical projection) using the Proximity Analysis tools in ArcGIS.[18] Note that because the household's location is approximated by the district centroid, households within the same district will have the same PGI score. For this reason, we will drop the h subscript in eq. (1) from here onwards.

Step 2: Computing the Export Exposure Index

The household-province PGI score captures the influence that a province's major population centers might have on the household. Given that exporting activities mainly take place through

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

[18]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.

cities, the influence of a province's exports on a household (if it exists) will be (i) inversely related to how far away the household is from the province's cities and (ii) positively related to how large these cities are. Hence, how exposed a household is to the exports of a province can be captured by interacting the volume of these exports with the household-province PGI score. Then, an aggregate export exposure index, which is our main causal variable, can be obtained by aggregating this interaction term over all provinces (indexed by j) as follows

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

It should be pointed out that the effect of export exposure *per se* is not of interest here. Instead, the export exposure index is a device for us to estimate the effect that exports might have on individuals, which is what we hope to observe. Because the export exposure index contains both cross-sectional and time variation, it allows us to use appropriate fixed effects strategy to deal with issues that makes estimating the relationship exports and labor participation of individuals difficult (see Sections 3.3 and 3.4).

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 any work, paid or unpaid. To capture this information, we construct a binary variable *Work*, which is equal to 1 if individual in question reports working and 0 if otherwise. We also look at the extensive margin of paid work as well as work in key sectors such as agriculture, manufacturing and services. Pertaining to each sector, we construct a binary variable to indicate if an individual reports employment in that sector and zero if otherwise. Finally, we also use information on 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 (paid or unpaid) 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 explore the robustness of our results.

Control Variables We consider the following control variables in our regressions. The first control variable is an import exposure index to capture the effect of imports on labor force participation. This is important in light of Amiti and Davis (2011), and Amiti and Cameron (2012) who have shown that imports may affect wages. For instance, Amiti and 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 and Cameron (2012) also find that in Indonesia, the production of intermediate inputs tends to be more skilled-intensive than production of final goods, and therefore, a reduction in input tariffs can reduce the skill premium. Given that imports could affect labor force participation through their effects on wages, it is 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:

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

We use $Import\_Exposure$ as opposed to imports as a control variable, for the same reason that $Import\_Exposure$ will not be "cleaned out" from a regression with household and province-year fixed effects. Furthermore, if exports could influence the labor force participation of individuals, one could also make a similar argument for imports as well. In this case, it would be more appropriate to control for $Import\_Exposure$ (instead of imports) as it allows the effect of imports to vary by the location of individuals.

The second control variable is the individual's age. This is motivated by Jensen (2012) who finds that younger women are significantly less likely to get married, have fewer children, and 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 is likely to 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 of this paper. Our empirical analysis is based on a panel of married males and married females aged from 20 to 65 years for the periods 1997, 2000 and 2007. We choose the minimum age to be equal to 20 years old to exclude younger individuals who might be attending school. Our base sample contains 13,149 individual-year observations for married females and 16,745 individual-year observations for married males. The summary statistics of the main variables are reported in Table 2. On average, compared to males, females 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 are less likely to be employed in agriculture, but more likely to be employed in manufacturing and sales services. Females are also less likely to be self-employed, government-employed or be a salary employee, but more likely to be engaged in housework and unpaid family work.

3.3 The Estimating Equation

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

$$W_{ihdjt} = \mu_h + \alpha_{jt} + \beta \ Export\_Exposure_{dt} + \gamma' C_{ihdjt} + \epsilon_{ihdjt}. \quad (4)$$

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 C. 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 α_{jt}.

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 on an individual's decision to work, we can only interpret its sign but not its size. This is because the size of β depends on the unit of measure for population chosen when constructing the PGI score. If we use population in millions, the size of the PGI score and thus of $Export\_Exposure$ will be smaller. In this case, β would be larger if we use population in millions to construct the PGI score. Conversely, if we use the actual population instead, β will be smaller. This implies that the magnitude of β has no intrinsic meaning. As discussed earlier, we use population in millions when constructing the PGI score so that β will have fewer leading zeros in its decimal, which makes reporting it easier in tables.

That being said, the sign of β can be interpreted in a meaningful way. In particular, it conveys information about whether export intensification itself (not just export exposure) has a positive or negative effect on a particular measure of work. For example, based on eq. (2), the effect that a 1% increase in exports across all provinces has on work is

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

on average. Because the PGI score is positive, whether exports affect work positively or negatively depends on the sign of β. For example, if β is positive, both export exposure and export intensification itself will have a positive effect on work on average. From eq. (5), notice that the effect of exports on work is heterogeneous across households. In particular, the effect is weak for households that are far from all cities, as captured by a small aggregated PGI score ($\sum_{j \in J} PGI_{dj}$). For the same reason, the effect is strong for households located in a large city (e.g. Jakarta) that is near other metropolitan areas as well. The heterogeneity in the effect of exports, as characterized by eq. (5), is important as it allows for the use of province-year fixed effects to address certain estimation issues that we discuss below.

3.4 Estimation Issues

Let us explore the relevance of some common estimation issues in the context of this study.

Reverse Causality One common estimation issue is reverse causality. For this to matter in the context of our estimating equation (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 of *Export_Exposure* comes from provincial level exports, which are unlikely to be influenced by an individual.

Self-Selection While the time series variation of *Export_Exposure* is driven by the provinces' exports, the cross-sectional variation of this index depends on the location of the household. Therefore, households that have better attributes for market work may choose to relocate closer to metropolitan areas. In this case, the geodesic distances that are used to compute *Export_Exposure* could be influenced by self-selection. To address the issue that location may be self-selected, we include household fixed effects (μ_h). To the extent that the location of a household is related to persistent, unobserved household characteristics, the issue of self-selected location may be addressed by using household fixed effects to partial out these unobserved household factors.

Unobserved Macroeconomic and Policy Shocks The link between individuals' work decisions and exports can 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.

Measurement Error Our main explanatory variable, *Export_Exposure*, is constructed using the individual's location at the district level and the value of exports at the province level. While the individual's location is unlikely to be misreported because there is cross-verification,[19] provincial export volumes could contain measurement error. If this was classical, the estimated effect of *Export_Exposure* could be attenuated. Another possible problem with measurement is associated with the *Work* variable. If women are reluctant to report truthfully about whether they are employed, their self-reported information about whether they work could be less responsive to *Export_Exposure* than what is true in reality.

Unfortunately, panel data regression cannot address the issue of measurement error, which means that the effect of *Export_Exposure* on *Work* in eq. (4) may not be identified. Nonetheless, if the measurement error in question leads to attenuation bias (which Section 4 offers some evidence for), our regression estimates would still be informative in that the true effect of *Export_Exposure* (if it exists) is likely to be stronger than what the estimates suggest.

4 Results

To examine if exports have gender-specific effects on work, we estimate eq. (4) separately for men and women. Other than Table 3, we report our results on women in the "A" affixed tables (e.g. Tables 4A, 5A, etc.). For men, the results can be found 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

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 an individual reports having worked in the past week. For now, work could refer to either paid or unpaid work such as work on a family farm. Later on, we will also consider the response of different types work (e.g., paid, unpaid, etc.) to exports. Because Work is a binary dependent variable, the coefficient

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

on *Export_Exposure* is the effect that *Export_Exposure* has on the *probability* that an individual is engaged in some form of work.

In Column (1) of Table 3, the coefficient of -0.257 on *Export_Exposure* suggests that women are less likely to work when they are more exposed to exports. Although the size of this coefficient has no meaningful interpretation, the coefficient itself can be used to calculate the effect of a 1% increase in exports across all provinces on the extensive margin of work. Following eq. (5), this effect is given by

$$-\frac{0.257}{100} * \sum_{j \in J} PGI_{dj} \equiv -\frac{0.257}{100} * \sum_{j \in J} \sum_{k \in K_j} \frac{p_k}{(1 + D_{dkj})^2}. \tag{6}$$

According to eq. (6), the effect of exports on *Work* is heterogeneous for individuals living across different parts of the country. In particular, the effect is stronger for women living near or within metropolitan areas and weaker if otherwise. For example, women in the capital city of Jakarta have an aggregate PGI score (i.e. $\sum_{j \in J} PGI_{dj}$) of 11.235. Therefore, using eq. (6), we find that women in Jakarta are 2.88 percentage points less likely to work when exports increase by 1% across all provinces.[20] By contrast, for women in Bima, about 1300 kilometers away from Jakarta, a 1% increase in exports across all province has a negligible effect on the probability that they work.

Unlike for women, Column (2) shows that *Export_Exposure* is not statistically significant for men, suggesting that men's labor supply is inelastic with respect to exports. In Section 5, we offer an explanation based on a simple theoretical model. The idea is that in a household where men have comparative advantage in paid market work and women in unpaid housework, men's labor supply would be inelastic as they devote all their time to market work. If the increase in exports increases the relative wage of men in a way that preserves their of comparative advantage in market work, then the labor supply of men would be unaffected while women would reduce their involvement in paid employment for unpaid housework.

Next, we examine the effect of *Export_Exposure* on the extensive margin of *paid* work only.

[20] To calculate this, we replace $\sum_{j \in J} PGI_{dj}$ with 11.235 in eq. (6) to obtain $-0.257/100 * 11.235 = 0.0288$, which is 2.88 percentage points.

To do so, we construct two dependent binary variables: *Own_Income* $(=1)$ if the person reports having earned an income and *Spouse_Income* $(=1)$ if the person's spouse reports having earned an income. This information is reported by both men and women, which implies that in the absence of any reporting discrepancy between couples, *Own_Income* reported by men (women) should be the same as *Spouse_Income* reported by their wives (husbands).

For men, both Tables 4A and 4B show that exports have little effect on whether they work for pay. For example, based on information about work reported by their wives, we find that *Export_Exposure* does not have a statistically significant effect on the probability that men work for pay (Column (2) of Table 4A). This is also observed when we consider self-reported information about work for pay by men as the dependent variable (Column (1) of Table 4B). By contrast, based on information about work reported by their husbands, we find that women are less likely to work for pay when exports increase (Column (2) of Table 4B). In this particular case, the coefficient on *Export_Exposure* (-0.709) is nearly three times (in absolute terms) the estimate of the baseline regression (-0.257) (Table 3), which defines work as paid market work and unpaid work for the family. In other words, when we consider paid work only, we find that exports have an even stronger negative effect on women's employment.

Because we have individual's work status reported by both self and spouse, we may use this information to investigate whether measurement error in self-reported information is present. For example, if women are reluctant to report truthfully about whether they work, what they report about themselves could be less credible than what their husbands report about them. If such measurement error in women's self-reported data is present, the estimated relationship between *Export_Exposure* on women's participation in paid employment will be weaker if we use women's self-reported information on employment than what is reported by their husbands.

Based on this idea, Tables 4A and 4B show that measurement error in women's self-reported data could be present. For example, when self-reported status in paid employment is used as dependent variable (Column (1) of Table 4A), the effect of *Export_Exposure* on the probability that women work for pay is only 15% of the effect that is obtained when the dependent variable is based on women's work status reported by their husbands (Column (2) of Table 4B). The substantially attenuated estimate in the first instance suggests that there could be measurement errors in self-reported information by women. Therefore, when women's self-reported information is used (as in the baseline regression), the true effect of exports on women's labor participation could be stronger than what our estimates suggest it to be.

As a further robustness check, we conduct a falsification exercise to examine if the negative association between exports and women's labor participation is causal, and not merely reflects co-movement possibly driven by some unknown factors. To do so, we estimate the effect of *Export_Exposure* on the lagged of *Work*.[21] The idea is that a forward variable cannot cause variables in the past. Therefore, *Export_Exposure* cannot possibly affect the lagged of *Work*.

If, however, there is a statistically significant relationship between *Export_Exposure* and the lagged of *Work*, we know that this relationship cannot be causal. Rather, this statistically significant relationship suggests that there could be unknown factors driving the co-movement between *Export_Exposure* and the lagged of *Work*. These factors might contribute to the co-movement between *Export_Exposure* and (contemporaneous) *Work* as well. In this case, the estimated effect of exports on women's labor participation (see Table 3) may not reflect causation.

To obtain evidence that exports have a causal effect on women's participation, we look at whether the estimated relationship between *Export_Exposure* and the lagged of *Work* (for women) is statistically *insignificant*. This would then suggests that unknown factors driving the co-movement between *Export_Exposure* and *Work*, even if they exist, are likely to be unimportant. Our regression estimates, which are omitted here to save space, have found such statistical insignificance to be the case.[22] Therefore, the negative estimated effect of exports on women's labor participation reported in this paper is likely to have causal interpretation and does not merely reflect correlation.

[21]The IFLS surveys contain information on work status in the previous years. However, they do not provide information on hours of work in the previous years. Hence, we are able to conduct such falsification test only for the binary variable *Work*.

[22]A statistically insignificant relationship between *Export_Exposure* and the lagged of *Work* is also found for men.

By Sector

The IFLS provides information on the sector in which an individual work is employed. We examine the relationship between exports and participation in three broad sectors – agriculture, manufacturing and services. To do so, we construct a binary dependent variable that indicates if an individual reports either paid or unpaid work associated with each sector. Agriculture and manufacturing are the largest exporting sectors in Indonesia: according to the WTO (2006), agricultural and manufacturing exports account for 17% and 43% of all Indonesian exports. 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 report 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 a coefficient of -0.107 on *Export_Exposure* (statistically significant at 1% level), this implies that for a woman with an average aggregated PGI score, a 1% increase in exports across all provinces would reduce her probability of work in the agricultural sector by 0.0029 percentage points. Likewise, an increase in exports also reduces women's probability of work in the manufacturing sector. With a coefficient of -0.131 on *Export_Exposure*, this implies that for woman with an average aggregated PGI score, a 1% increase in exports across all provinces would reduce her probability of work in the manufacturing sector by 0.0036 percentage points.[23] With respect to services, we find that exports do not have a statistically significant effect on women's participation. Therefore, the negative relationship between exports and women's participation is driven mainly by entry and exit into the agricultural and manufacturing sectors.

For men, we consider participation in agriculture, manufacturing, services as well as construction. The construction sector is the forth largest sector of male employment, where nearly 8% of all men in our sample are employed. Just as in our baseline regressions, we find no evidence that exports affect men's participation in each of the four sectors, which reinforces the idea that men's labor supply is inelastic with respect to exports.

[23]The average aggregated PGI score for women is 0.0276529. For agriculture, the calculation is based on $(-0.107/100) * 0.0276529 = -0.000029$. For manufacturing, it is $(-.131/100) * 0.0276529 = -0.000036$.

By Types of Work

In this discussion, we examine the effect of exports on participation in different (non-mutually exclusive) types of work: self-employment, housework (i.e., housekeeping), employment with the government, salaried work, or unpaid family work. Column (1) of Tables 6A and 6B show that exports are statistically insignificant for self-employed work for both men and women. Given that the majority of self-employed females are in the services while the majority of self-employed males are in agriculture,[24] the statistically insignificant effect of exports on self-employment is consistent with the evidence that exports have no effect on women's participation in the services (Table 5A) and men's participation in general (Table 5B).

With respect to participation in housework, Column (2) of Tables 6A and 6B suggest that exports would lead to more household production by women on average but not by men. Echoing this result, Column (3) of Tables 6A and 6B suggest exports would lead to less salaried work only by women on average.[25] These observations are consistent with exports having a negative effect on women's participation in paid employment (Tables 4A and 4B) and across sectors (Table 5A).

Finally, for both men and women, Column (4) of Tables 6A and 6B show that participation in government related work is largely unaffected by exports, which seems sensible if the government sector is largely protected from macroeconomic shocks. In Column (5), we also find that exports are statistically insignificant for unpaid family work for both men and women. For women, this result could be driven by the fact that a large proportion of those in unpaid family work (22%) are in the services sector, whose extensive margin of work is on average unaffected by exports (Table 5A).

In sum, recall that our baseline regression (Table 3) considers work to encompass 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 participa-

[24] According to Table 2, 42% of females and 50% of males in our sample report being self-employed. However, for self-employed females, 20% of them work in agriculture, 13% in manufacturing and 67% in services. By contrast, for self-employed males, 52% of them work in agriculture, 6% in manufacturing, 31% in the services and 3% in construction.

[25] As a remark, we have also looked at the effect of exports on salaried work participation in agriculture, manufacturing and services sector. For each of these sectors, we find the effect of exports is negative and statistically significant (at 5%) for women but is statistically insignificant for men.

tion (in our baseline regression) is driven mainly by the reduction of paid work (and not unpaid family work) at the extensive margin.

By Previous Year Work Status

We now examine the effect that exports may have on entry versus exit into the labor market. To estimate the relationship between exports and entry (or, exit), we take a sample of individuals who have not worked (or have worked) in the year prior to the census year and investigate whether an increase in exports would encourage them to enter (or exit). Labor participation tends to be history dependent. For example, among women who are working in the current year, 93% of them report having worked in the previous year; among women who are not working, 58% of them did not work in the previous year as well. Similarly, for men, 98% of those who are currently working had worked in the previous year while 63% of those who are not currently working did not do so in the previous year.

For women, Table 7A suggests that exports do not have a statistically significant effect on entry. In other words, women who did not work in the previous year largely remained unemployed even when exports increase. However, for those who were working in the previous year, an increase in exports has a negative effect on their probability of work in the current year. This suggests that an increase in exports encourages women who were previously employed to exit the labor market.

For men who did not work in the year before, an increase in exports increases the probability that they work in the current year. However, for those who had worked in the previous year, exports do not have a statistically significant effect in encouraging them to leave the job market. In other words, men would try to gain employment (if they were unemployed) and stay employed regardless of the variation in exports.

4.2 Intensive Margin of Work

Finally, we examine the effect that an increase in exports might have on the intensive margin of work, which is reflected by the hours of work performed by those who are employed. We estimate the relationship between *Export_Exposure* and *Hours_Last_Week* (see Tables 8A and 8B) and *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 (paid or unpaid) 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 a measure of the intensive margin). Therefore, exports may reduce participation in salaried work by women along the intensive margin, in addition to reducing the probability of work that we have observed in Table 6A. In addition, we find that an increase in exports has a positive effect on the hours of unpaid family work and hours of housework, suggesting that an increase in exports would encourage women to substitute their time away from paid market work towards unpaid non-market work. Interestingly for men, we also find that they tend to reduce their hours in paid employment when exports increase. One possible explanation, although is not something we can verify, is that an increase in exports has an effect of raising wages for men to a point where the income effect is dominant.

Next, we look at the relationship between exports and the intensive margin of work by sector. In this exercise, there is little to take away as our estimated coefficient on *Export_Exposure* is mainly statistically insignificant. For women, there appears to be a negative relationship between exports and hours of work in the services, although we have previously observed that export exposure is not statistically significant at the extensive margin. For men, an increase in exports is associated with less work in agriculture and more work in construction and manufacturing. However, these interpretations should be viewed with some caution as the link between export exposure and the intensive margin of work by sector is generally statistically insignificant.

5 A Simple Theoretical Framework

Using a simple theoretical model, we offer an explanation for why women would tend to reduce work when exports increase while the labor supply of men is inelastic with respect to exports.

Our framework is based on a simple collective household that comprises a husband (representing men) and a wife (representing women) who jointly maximize a household's utility function given by[26]

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

where $U^f(\cdot)$ is the wife's utility function, $U^m(\cdot)$ is the husband's utility function, μ is a measure of the wife's relative bargaining power,[27] 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:

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

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.[28] 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 female's absolute advantage in producing H, 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 and q^f) is equal to the amount of wages they earned from market employment, w^m and w^f:

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

The time allocation between market and non-market activities by the husband and wife and their the optimal level of private consumption can then be determined by maximizing the household's

[26]See Browning et al (2014) for an analysis of various household models, including a collective household model.

[27]Note that we assume that μ is fixed. See Browning et al (2014) for an analysis of a richer class of model where μ is endogenous.

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

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 husband's over wife's wages. 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 the 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 the 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).[29] For the 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

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

If an increase in exports raises the wage gap (i.e. ω), 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. This leads us to the following proposition.

Proposition 1 *If the gender wage gap increases with exports, women will reduce their hours of paid market work and increase their hours of unpaid home production. Men's hours of paid work*

[29] 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.

are unaffected by the variation in exports.

The positive association between the relative wage of men and exports is one possible mechanism that leads to exports having a negative effect women's participation. This positive association may arise because of differences in the sectorial composition of male and female workers, which, for example, may occur if females tend to work in the informal sector and males in the formal sector. In this case, export intensification raises demand for labor in the formal exporting sector, hence, increasing the relative men's wage.

To obtain some evidence on the positive relationship between exports and the gender wage gap, we look at the cross-sectional data from the 2007 wave of the Indonesian National Labour Survey (Sakernas 2007). From here, we calculate an average female and average male earned income at the province level,[30] and define the gender income gap as a ratio of the average male to the average female earned income. In Figure 3, we plot the relationship between the income gender gap in 2007 and the log of exports in 2006 based on province level information. The relationship between the two is mildly positive with a correlation of 0.3. This provides some evidence the relative wage of men and exports are positively related, as provinces that export more also tend to have larger income gap between men and women.

6 Conclusion

In this paper, we examine if exports have unequal influence on the labor market outcomes of men and women in Indonesia. To deal with identification issues arising primarily from omitted households characteristics and macroeconomics and policy shocks, we construct a new measure – the exports exposure index – that captures the differentiated influence of exports on individuals depending on how close individuals are to cities. The export exposure index has both cross-sectional and time variation. Hence, it allows to use household and province-year fixed effects to help in estimating the effect of exports on individuals' labor participation.

[30] We use the question on net income earned in the last month from the main job. The data is available for 24 provinces.

Our empirical results indicate that an increase in exports has no statistically significant effect on men, but encourages women to allocate time away from paid employment towards unpaid house or family work. We show that females work decisions respond to exports both along extensive and intensive margins - their probability of work decreases, especially in two major exporting sectors - agriculture and manufacturing, as well as their hours of salaried work. Females also engage in more housework and increase their hours of work as unpaid family worker. These results are consistent with our theoretical predictions based on a simple collective household model. The intuition behind these theoretical predictions is that the relative increase in spousal income (following an increase in export exposure) strengthens females' comparative advantage in unpaid housework and allows them to devote more time to home production.

In short, our results suggest that intensification of exports, which is an aspect of more broadly defined globalization, benefited females in Indonesia mostly through improvements in household income but did not create additional working opportunities targeted specially for women.

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

	Female		Male	
	Mean	sd	Mean	sd
Age	40.96433	11.24749	41.53114	10.98397
Work	.860978	.3459826	.984473	.12364
Work (in agriculture)	.3515096	.4774599	.3669155	.4819776
Work (in manufacturing)	.1429767	.3500623	.1184831	.323189
Work (in services)	.486729	.4998429	.344461	.4752064
Work (in construction)	.0076051	.0868785	.0779337	.2680753
Housework	.1942353	.3956259	.0126008	.111547
Self-employed Work	.4182067	.4932832	.5005076	.5000147
Government Work	.0704236	.2558693	.1022395	.302972
Salaried Work	.220397	.4145301	.3324574	.471108
Unpaid Family Work	.2597156	.4384952	.0236489	.1519571
Hours_Usual	37.58607	21.03	43.82971	17.47164
Hours_Last_Week	33.74863	22.88576	39.77973	20.19421
Export_Exposure	.2852358	2.159223	.32819	2.726081
Import_Exposure	.2761553	2.101643	.3175702	2.660138
PGI	.0276529	.193556	.0318034	.2491221
Obsevations	13149		16745	

Table 3 : Probability of work (Females and Males)

	(1) Females	(2) Males
Dependent Variable:	*Work*	
Export Exposure	-0.257***	0.0110
	(0.0974)	(0.122)
Import Exposure	0.252***	-0.00748
	(0.0959)	(0.133)
Age	0.496***	0.0301***
	(0.0277)	(0.00246)
Age Squared	-0.000572***	-0.000388***
	(3.28e-05)	(2.95e-05)
Constant	-1.078***	0.416***
	(0.0773)	(0.0597)
Observations	23,150	18,408
R-squared	0.050	0.055
Number of households	9,492	8,424
Household FE	Yes	Yes
Year*Province FE	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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

	(1)	(2)
Dependent Variable	*Own_Income*	*Spouse_Income (Husband)*
Export Exposure	-0.105	-0.0679
	(0.211)	(0.133)
Import Exposure	0.149	0.185
	(0.312)	(0.232)
Age	0.0486***	0.0211***
	(0.00588)	(0.00418)
Age Squared	-0.000555***	-0.000328***
	(7.29e-05)	(5.32e-05)
Constant	-0.511***	0.583***
	(0.116)	(0.0826)
Observations	12,501	12,500
R-squared	0.032	0.044
Number of Households	6,881	6,881
Household FE	Yes	Yes
Year*Province FE	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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

	(1)	(2)
Dependent Variable	*Own_Income*	*Spouse_Income (Wife)*
Export Exposure	0.122	-0.709**
	(0.126)	(0.285)
Import Exposure	-0.145	0.960**
	(0.233)	(0.421)
Age	0.0242***	0.0257***
	(0.00469)	(0.00681)
Age Squared	-0.000301***	-0.000240***
	(5.49e-05)	(8.12e-05)
Constant	0.506***	-0.237*
	(0.0986)	(0.142)
Observations	11,242	11,234
R-squared	0.032	0.036
Number of Households	6,454	6,453
Household FE	Yes	Yes
Year*Province FE	Yes	Yes

Robust standard errors in 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	-0.107***	-0.131***	-0.110
	(0.0268)	(0.0488)	(0.0930)
Import Exposure	0.0946***	0.128***	0.130
	(0.0295)	(0.0477)	(0.0929)
Age	0.0171***	0.00228	0.0337***
	(0.00187)	(0.00152)	(0.00234)
Age Squared	-0.000157***	-5.41e-05***	-0.000402***
	(2.21e-05)	(1.76e-05)	(2.77e-05)
Constant	-0.148**	0.109***	-0.851***
	(0.0723)	(0.0372)	(0.0877)
Observations	23,150	23,150	23,150
R-squared	0.046	0.014	0.036
Number of Households	9,492	9,492	9,492
Household FE	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes

Robust standard errors in 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	0.0367	0.00859	0.0265	0.0584
	(0.0344)	(0.0571)	(0.0765)	(0.0372)
Import Exposure	-0.0476	-0.0259	-0.0133	-0.0719*
	(0.0374)	(0.0615)	(0.0812)	(0.0433)
Age	0.00255	-0.00203	0.0189***	0.00509***
	(0.00294)	(0.00237)	(0.00328)	(0.00177)
Age Squared	3.22e-05	-1.20e-05	-0.000235***	-7.66e-05***
	(3.40e-05)	(2.71e-05)	(3.76e-05)	(2.02e-05)
Constant	0.191**	0.267***	0.121	-0.0363
	(0.0850)	(0.0653)	(0.0914)	(0.0401)
Observations	18,408	18,408	18,408	18,408
R-squared	0.026	0.021	0.013	0.010
Number of Households	8,424	8,424	8,424	8,424
Household FE	Yes	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes	Yes

Robust standard errors in 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)
Dependent Variable	*Self Work*	*Housework*	*Government Work*	*Salaried Work*	*Unpaid Family Work*
Export Exposure	-0.0956	0.192*	0.0360	-0.241***	-0.0563
	(0.0799)	(0.0987)	(0.0235)	(0.0651)	(0.0836)
Import Exposure	0.101	-0.181*	-0.0354	0.238***	0.0604
	(0.0810)	(0.0957)	(0.0251)	(0.0639)	(0.0912)
Age	0.0328***	-0.0299***	0.00584***	0.00567***	0.00683***
	(0.00231)	(0.00280)	(0.000947)	(0.00191)	(0.00184)
Age Squared	-0.000331***	0.000284***	-8.02e-05***	-0.000113***	-7.43e-05***
	(2.75e-05)	(3.33e-05)	(1.18e-05)	(2.21e-05)	(2.17e-05)
Constant	-0.456***	1.771***	-0.0393	-0.377***	0.190**
	(0.0598)	(0.0785)	(0.0958)	(0.0544)	(0.0907)
Observations	23,150	23,150	23,150	23,150	23,150
R-squared	0.036	0.035	0.017	0.031	0.030
Number of Households	9,492	9,492	9,492	9,492	9,492
Household FE	Yes	Yes	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes	Yes	Yes

Robust standard errors in 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)
Dependent Variable	*Self Work*	*Housework*	*Government Work*	*Salaried Work*	*Unpaid Family Work*
Export Exposure	0.00320	0.00990	0.000800	0.0518	-0.0204
	(0.0640)	(0.0124)	(0.0363)	(0.0705)	(0.0254)
Import Exposure	0.0211	-0.00800	-0.00857	-0.0645	0.0148
	(0.0684)	(0.0140)	(0.0390)	(0.0782)	(0.0256)
Age	0.0185***	-0.00240*	0.0203***	-0.00993***	-0.00864***
	(0.00355)	(0.00127)	(0.00173)	(0.00314)	(0.00161)
Age Squared	-0.000125***	3.02e-05**	-0.000231***	7.44e-06	7.65e-05***
	(4.09e-05)	(1.52e-05)	(2.02e-05)	(3.58e-05)	(1.78e-05)
Constant	-0.206***	0.0275	-0.316***	0.803***	0.276***
	(0.0742)	(0.0336)	(0.0356)	(0.0829)	(0.0750)
Observations	18,408	18,408	18,408	18,408	18,408
R-squared	0.037	0.019	0.034	0.098	0.022
Number of Households	8,424	8,424	8,424	8,424	8,424
Household FE	Yes	Yes	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes	Yes	Yes

Robust standard errors in 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	0.181	-0.277**
	(1.383)	(0.117)
Import Exposure	-0.364	0.305***
	(1.418)	(0.112)
Age	0.0343*	0.0301***
	(0.0189)	(0.00380)
Age Squared	-0.000452**	-0.000309***
	(0.000225)	(4.43e-05)
Constant	-0.370	-0.575***
	(0.367)	(0.0889)
Observations	2,426	13,432
R-squared	0.120	0.049
Number of Households	2,166	6,903
Household FE	Yes	Yes
Year*Province FE	Yes	Yes

Robust standard errors in 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	2.257***	-0.0602
	(0.867)	(0.107)
Import Exposure	-3.073*	0.0630
	(1.676)	(0.117)
Age	0.0791	0.00993***
	(0.0584)	(0.00189)
Age Squared	-0.000954	-0.000123***
	(0.000647)	(2.22e-05)
Constant	-0.490	0.807***
	(1.144)	(0.0468)
Observations	659	17,121
R-squared	0.568	0.014
Number of Households	616	8,101
Household FE	Yes	Yes
Year*Province FE	Yes	Yes

Robust standard errors in 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)
	Hours of work in the previous week							
Dependent Variable	*any work*	*salary work*	*housework*	*self work*	*unpaid family work*	*agriculture*	*manufacturing*	*service*
Export Exposure	-18.02*	-41.56*	134.0	-26.97	78.31***	243.1	15.41	-27.11**
	(10.31)	(24.31)	(209.8)	(19.89)	(15.20)	(224.1)	(23.53)	(11.39)
Import Exposure	18.70*	40.89*	-128.1	31.63	-72.88***	-157.3	-23.36	26.86**
	(10.25)	(23.53)	(189.7)	(21.04)	(16.22)	(245.8)	(25.33)	(11.32)
Age	0.603***	-0.210	-0.0133	0.820*	0.413	0.847***	-0.384	1.034***
	(0.221)	(0.509)	(0.618)	(0.457)	(0.440)	(0.286)	(0.650)	(0.364)
Age squared	-0.00768***	-0.000359	-0.000886	-0.00905*	-0.00561	-0.00970***	0.00527	-0.0110**
	(0.00258)	(0.00638)	(0.00695)	(0.00506)	(0.00501)	(0.00329)	(0.00785)	(0.00431)
Constant	24.67***	46.26***	19.98	18.22*	24.31**	9.276	42.24***	7.804
	(4.628)	(10.41)	(16.64)	(10.41)	(9.524)	(6.295)	(13.14)	(7.588)
Observations	11,355	2,904	2,576	5,531	3,422	4,630	1,886	6,433
R-squared	0.018	0.058	0.159	0.018	0.104	0.103	0.063	0.022
Number of Households	6,216	2,085	2,242	3,544	2,350	2,743	1,388	3,923
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Hours of work in the previous week							
Dependent Variable	*any work*	*salaried work*	*housework*	*self work*	*construction*	*agriculture*	*manufacturing*	*service*
Export Exposure	-3.313	-12.39*	-2.225e+10	-7.170	1.297	22.66	-2.894	-13.36*
	(4.587)	(7.377)		(20.71)	(18.93)	(109.6)	(10.40)	(7.242)
Import Exposure	4.592	12.98*	2.107e+10	9.500	8.510	-10.18	3.228	14.02**
	(4.961)	(7.300)		(20.83)	(18.65)	(101.7)	(12.91)	(7.101)
Age	0.531***	0.613	-0.543	0.787***	-0.369	0.740**	0.0217	0.775*
	(0.167)	(0.386)		(0.264)	(0.712)	(0.288)	(0.625)	(0.399)
Age Squared	-0.00815***	-0.00974**	0.00105	-0.0112***	0.00303	-0.00989***	-0.00227	-0.00873*
	(0.00197)	(0.00483)		(0.00300)	(0.00891)	(0.00329)	(0.00755)	(0.00476)
Constant	34.37***	34.46***	1.522e+08	28.97***	49.24***	20.14***	46.09***	25.36***
	(3.571)	(7.615)		(5.798)	(14.78)	(6.291)	(12.52)	(8.265)
Observations	16,559	5,604	213	8,410	1,308	6,169	1,991	5,798
R-squared	0.024	0.035	0.663	0.040	0.120	0.051	0.070	0.020
Number of Households	8,006	3,778	206	4,700	960	3,430	1,509	3,707
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in 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)
	Usual hours of work per week							
Dependent Variable	*any work*	*salaried work*	*housework*	*self work*	*unpaid family work*	*agriculture*	*manufacturing*	*service*
Export Exposure	-20.64**	-47.09**	147.3	-22.18	72.22***	-106.1	-5.999	-23.14**
	(9.757)	(22.84)	(245.1)	(17.08)	(19.46)	(169.9)	(24.39)	(11.03)
Import Exposure	21.90**	45.54**	-145.7	27.48	-67.63***	149.3	-11.52	23.03**
	(9.743)	(21.91)	(227.5)	(18.21)	(20.61)	(179.2)	(27.45)	(10.95)
Age	0.654***	0.136	0.493	0.725*	0.706*	0.690***	-0.252	1.124***
	(0.206)	(0.480)	(0.619)	(0.435)	(0.406)	(0.264)	(0.609)	(0.345)
Age Squared	-0.00847***	-0.00461	-0.00892	-0.00859*	-0.00954**	-0.00857***	0.00331	-0.0122*
	(0.00239)	(0.00598)	(0.00722)	(0.00479)	(0.00458)	(0.00302)	(0.00738)	(0.00411
Constant	25.25***	43.71***	20.79	24.53**	21.20**	18.10***	45.86***	10.28
	(4.332)	(9.873)	(16.35)	(9.933)	(8.894)	(5.823)	(12.23)	(7.176)
Observations	11,331	2,900	2,558	5,507	3,418	4,623	1,883	6,410
R-squared	0.014	0.058	0.139	0.015	0.065	0.049	0.062	0.023
Number of Households	6,208	2,082	2,231	3,536	2,349	2,740	1,385	3,917
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9B : Usual hours of work (Males)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Usual hours of work per week						
Dependent Variable	*any work*	*salaried work*	*self work*	*construction*	*agriculture*	*manufacturing*	*service*
Export Exposure	-1.037	-1.812	-6.160	21.44	-100.2**	8.069	-2.977
	(4.022)	(4.465)	(19.27)	(21.00)	(41.09)	(10.96)	(4.784)
Import Exposure	1.409	0.871	9.115	-15.29	102.5***	-8.712	2.209
	(4.244)	(4.819)	(19.57)	(20.03)	(37.37)	(13.14)	(5.263)
Age	0.515***	0.770**	0.846***	0.771	0.822***	-0.417	0.672*
	(0.146)	(0.325)	(0.233)	(0.610)	(0.236)	(0.511)	(0.368)
Age Squared	-0.00735***	-0.0111***	-0.0110***	-0.00902	-0.0100***	0.00378	-0.00791*
	(0.00171)	(0.00410)	(0.00267)	(0.00757)	(0.00275)	(0.00611)	(0.00437)
Constant	43.73***	41.11***	28.80***	31.30**	30.12***	55.72***	31.71***
	(3.214)	(6.407)	(5.010)	(12.59)	(5.023)	(10.46)	(7.612)
Observations	16,529	5,589	8,397	1,307	6,154	1,989	5,789
R-squared	0.013	0.034	0.016	0.127	0.024	0.091	0.014
Number of Households	7,993	3,768	4,692	959	3,421	1,507	3,700
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 1: Jakarta in relation to other cities in Indonesia

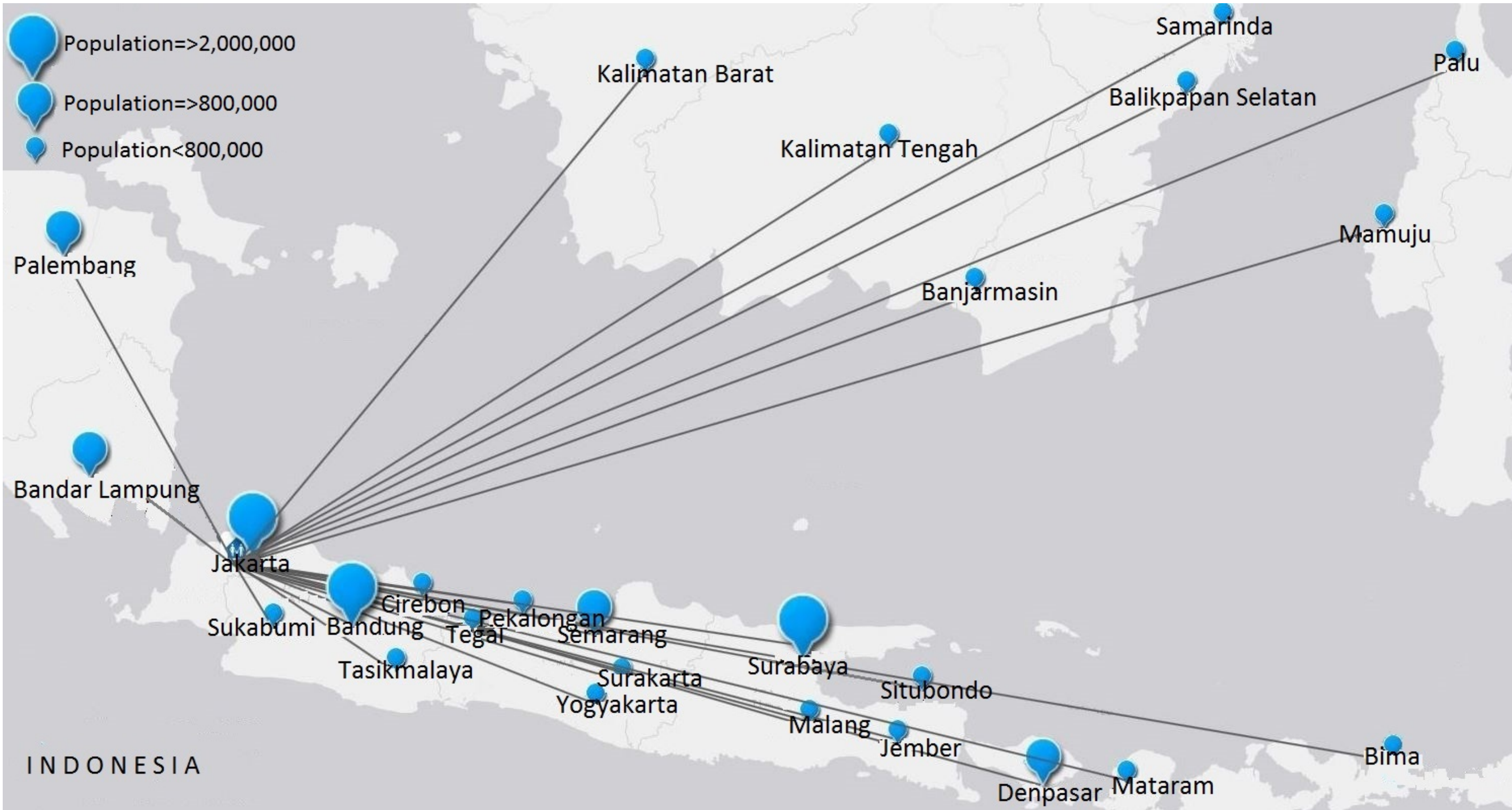


Figure 2: Bima in relation to other cities in Indonesia

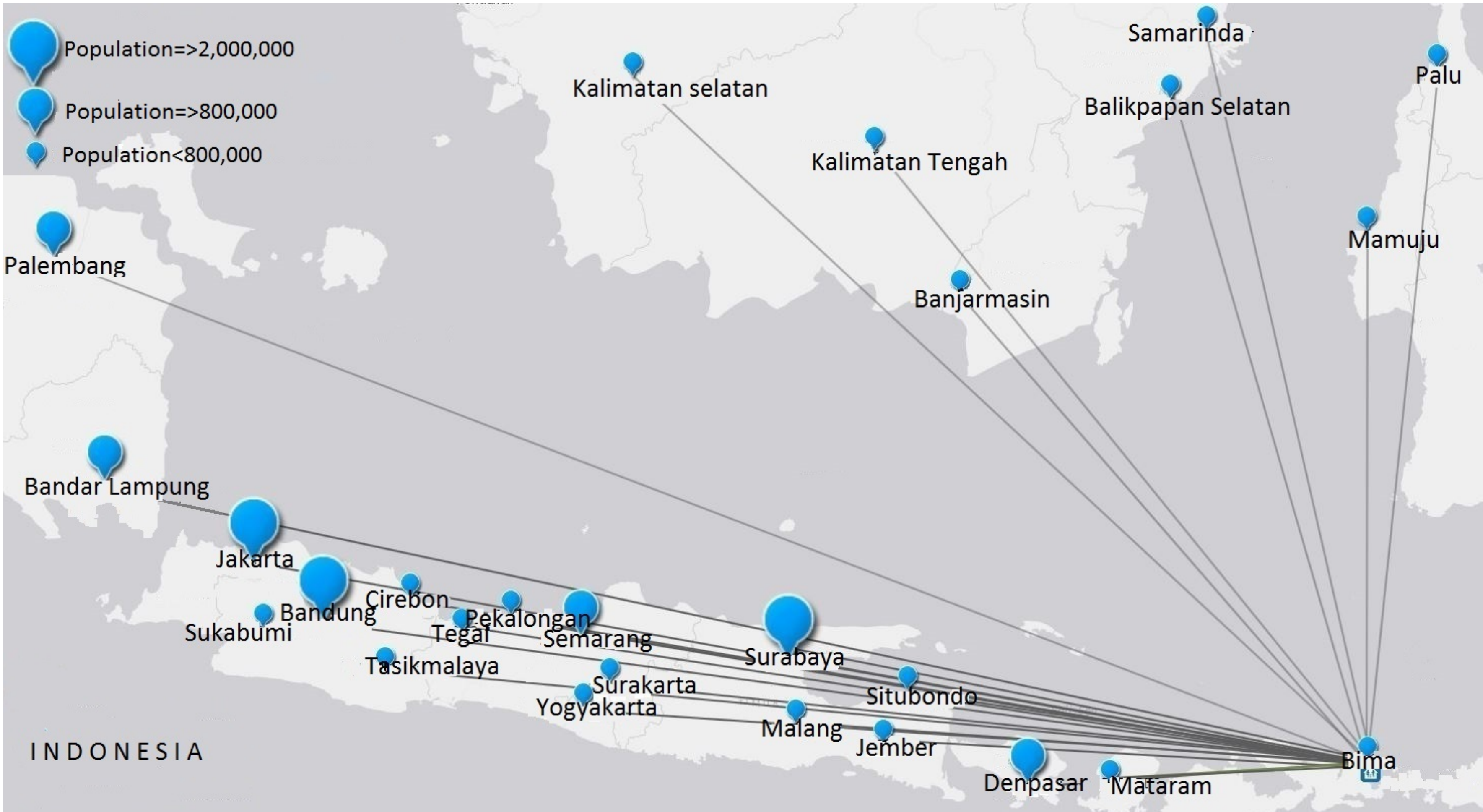
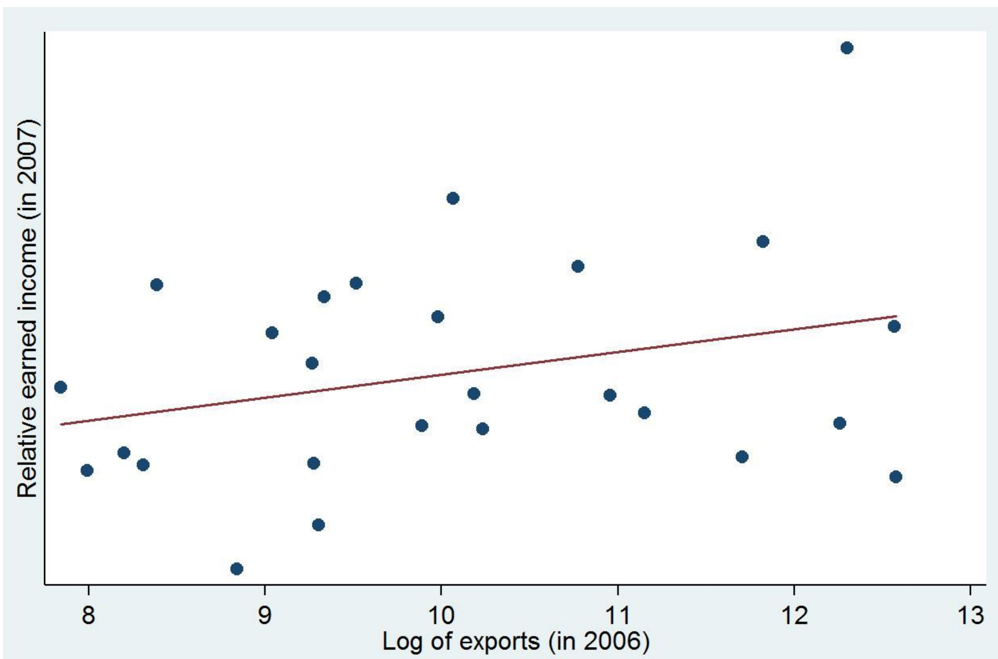


Figure 3: Relative earned income of men over women in 2007 and log of exports in 2006 by province



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