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# Looking for the Bright Side of the China Syndrome: Rising Export Opportunities and Life Satisfaction in China

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## Highlights

- This study is part of the recent academic literature which aims at assessing the social consequences (on employment, but also on health or quality of life) of globalisation, and in particular the rise of Chinese exports.
- We use the results of a large survey on the quality of life of nearly 25,000 Chinese to estimate the impact of export capacity growth on their life satisfaction.
- We show that the rise in exports has had a significant impact on the well-being of local populations. This effect goes beyond income growth.
- This positive effect is very clear for urban populations in employment, but it is also visible for other family members, even when they are not working.
- In addition, we do not observe any negative effects on physical and mental health.

RESEARCH AND EXPERTISE ON THE WORLD ECONOMY

## Abstract

China's increased export capacity in recent decades has disrupted developed-country labor markets and the well-being of workers exposed to foreign competition. We here attempt to complete the assessment of the social and human consequences of globalization by exploring the other side of this "China syndrome". We evaluate the extent to which increased export opportunities have influenced well-being in China using panel data on approximately 25,000 adults across 122 Chinese localities in 2010, 2012 and 2014. The results show that perceived life satisfaction rises significantly as local export markets grow. This effect goes beyond higher local GDP per capita and individual incomes.



## Keywords

Happiness, Well-being, Globalization, China.

## JEL

F61, F66 ,I31, J28.



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RESEARCH AND EXPERTISE ON THE WORLD ECONOMY

# Looking for the bright side of the China Syndrome: Rising export opportunities and life satisfaction in China

Matthieu Crozet*, Laura Hering† and Sandra Poncet ‡

## 1. Introduction

Since China's adoption of its open-door policy, its integration into world trade has proceeded at an astounding pace. From one of the most closed economies under Mao, China has become the world's largest exporter of manufactured goods, accounting for 19% of world manufacturing exports in 2016. It goes without saying that this change did not occur without significant upheaval in the social equilibrium in both China and the rest of the world. A recent flourishing literature has focused on the disruptive repercussions of the surge of Chinese exports on its partners' labor markets. In their influential study, Autor et al. (2013) call this the "China syndrome", and estimate that the rise in exposure to Chinese exports was behind at least one quarter of industrial job losses in the United States between 1990 and 2007. Follow-up work has confirmed that rising import competition from goods produced in Chinese factories is associated with worsening local labor-market conditions, including lower wages, falling labor-force participation rates and higher unemployment (see, for instance, Acemoglu et al., 2016; Autor et al., 2014; Balsvik et al., 2015; Caliendo et al. 2015; Dauth et al., 2017; Ebenstein et al. 2015; Hummels et al., 2016; Malgouyres, 2017b; Pierce and Schott, 2016a). These labor-market adjustments have far-reaching repercussions, from electoral outcomes[1] to mental health.[2]

This recent work tends to paint a bleak picture of globalization in general, and China's internationalization in particular. However, it only provides an incomplete assessment of the social and human consequences of Chinese trade. Within developed countries, the social costs must be compared with the trade gains. The increasing availability of cheap goods from China has benefited local consumers[3] and growing Chinese demand has created jobs in export sectors.[4] At the world level, the social costs from the growth of Chinese exports in developed countries should be weighed against the potential benefits for the Chinese population.

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[1]Import penetration at the local level fosters extreme or anti-globalization votes. It is associated with fewer votes for moderate representatives in the US (Che et al., 2016; Autor et al., 2017), more votes for Brexit in the UK (Colantone and Stanig, 2018) and for extreme-right parties in Europe (Dippel et al. 2015; Malgouyres, 2017).

[2]Greater import competition is found to have detrimental effects on the physical and mental health of workers (McManus and Schaur, 2016; Colantone et al., 2015) and leads to higher suicide rates (Pierce and Schott, 2016b).

[3]e.g. Fajgelbaum and Khandelwal (2016) and Feenstra and Weinstein (2017).

[4]e.g. Feenstra et al. (2017).

This paper looks at the other side of this "China syndrome" and evaluates the effect of greater exports on the well-being of the Chinese. To our knowledge this represents the first work on this question. Our empirical analysis is based on panel data from the China Family Panel Studies (CFPS), a nationally-representative survey launched in 2010 that follows about 25,000 individuals in 122 localities in 2010, 2012 and 2014. By tracking individuals over time, this survey allows for the control of the personal time-invariant determinants of well-being. We can hence accurately estimate the consequences of changes in the personal environment of each individual. We evaluate the effect of export opportunities on well-being in China by linking the changes in individual reported life satisfaction to the change in the foreign demand for goods produced in the locality where they live. We consider the various monetary and non-monetary transmission mechanisms of export opportunities, and look beyond the direct channel of the labor-market effects within the worker's entourage. Our results lead to a better understanding of how the well-being effects experienced by those who are exposed to improved export opportunities via their work subsequently spill over to others, including the inactive.

The extraordinary rise in living standards in China is beyond question. China's forced-march economic development has helped to lift more than 800 million people out of poverty since the start of its economic reform, to the extent that it contributed greatly to the fall in world poverty and inequality (World Bank, 2016). But it is by no means certain that globalization, from China's perspective, has been happy. The increase in Chinese export capacities has come at the cost of profound industrial, ecological and social changes. The Chinese have undoubtedly paid for their income growth through changes in their lifestyles, environment and working conditions, and there is no guarantee that higher income has been able to offset these social costs. It first seems clear that the rise in Chinese income in the 1990s and 2000s was not accompanied by a comparable rise in well-being. China is often used to illustrate the "paradox of unhappy growth" (Graham and Lora, 2009). The survey data[5] reveal that between 1990 and 2010, the well-being reported by the Chinese did not increase significantly (Easterlin et al., 2012 ; Bartolini and Sarracino, 2015). It in fact tended to fall between 1990 and 2000, before making progress thereafter. Second, income is only one component of happiness, and economic and social instability, as well as workplace pressure, also play an important role. On this point, the existing literature is rather limited and disparate. Aghion et al. (2016) note that the economic upheavals inherent in a process of rapid growth ("destructive creation") can produce ambiguous well-being effects insofar as agents may fear change and suffer from permanent uncertainty. Moreover, greater international openness and the continued search for better export performance may go hand-in-hand with increased pressure on employees and deteriorating working conditions. Hummels et al. (2016), for example, use Danish data to show that employees in exporting firms work more and suffer more frequent work accidents and illness.

Our work aims to identify the causal link between export opportunities and life satisfaction at the local level in China. Intuitively, a positive export shock in a locality might affect

[5]These include the World Values Survey (www.worldvaluessurvey.org), the Asiabarometer (www.asiabarometer.org), surveys by Gallup (www.gallup.com), a survey by Horizon Research Consultancy Group (www.agmr.com/members/horizon.html), and the Pew Research Center's 2011 Global Attitudes Project (http://www.pewglobal.org/category/datasets/).

well-being via three channels: a "quantity" effect (job creation), a "price" effect (wage increases) and a "quality" effect. The latter may be positive, via improved non-monetary benefits for employees, a wave of optimism linked to better economic prospects, improved working conditions etc. But the quality channel can also reduce well-being if greater foreign demand is accompanied by increased pressure on workers, longer working days, worse working conditions or, more generally, greater uncertainty from the rapid change in the economic environment. Even though we will start our empirical analysis with a short section on the foreign-demand effect on the "quantity" and "price" channels, we will mainly focus explicitly on this "quality" effect. Our main specification will thus control for individual income and employment status.[6]

The empirical analysis tackles the potential endogeneity problem that reflects two separate issues. The first is an omitted-variable bias. A locality's export performance is likely correlated with a wide range of other local characteristics (the quality of social and economic facilities, the competence of the political authorities, know-how and social and human capital, etc.), and these characteristics can also influence well-being. We then run the risk of wrongly attributing the beneficial effect of these other partly-unobserved characteristics to trade openness. The second endogeneity concern is reverse causality, whereby the rise in export opportunities is itself caused by a higher level of local well-being: a happier community that is more confident in the future is more likely to engage in trade-promoting policies and encourage productive investment.

We take a two-fold approach to these two endogeneity problems. We first appeal to the panel structure of our data to exploit the changes in life satisfaction over time for the same individual, rather than any cross-section comparison of different individuals. We hence eliminate any problems resulting from unobserved time-invariant characteristics of the individual (personality, physiological characteristics etc.) or the locality in which he/she lives (climate, topography etc.). We furthermore control for time-varying local characteristics by including local macroeconomic variables and province-year fixed effects.

Second, instead of looking at the export performance of a locality, we rely on an indicator that is independent of local characteristics. Following standard gravity trade models (Head and Mayer, 2014), locality export performance reflects three main types of factors: local supply capacity, foreign demand and the bilateral ease of trade (transport costs, trade protection and facilities for exporting companies). Local supply capacity covers the production capacity and price competitiveness of local businesses, both of which are subject to the endogeneity problems discussed above. The bilateral ease of trade is also subject to omitted variables as it is influenced by the physical geography and infrastructure of the locality. Changes in foreign demand, on the other hand, do not depend on local economic conditions but rather reflect the economic situation of trading partners and changes in their requirements for products that the locality exports.

[6] For more empirical evidence of foreign demand on these three channels see, for instance, Los et al. (2015) for a discussion of the impact of foreign demand on employment creation in China, McCaig and Pavcnik (2018) on the effect of tariff reductions in Vietnam on formal employment, and Hering and Poncet (2010) for an analysis of the impact of increased demand on Chinese individual wages. There are only few contributions that also explicitly consider the importance of changes in foreign demand on the "quality" channel in developing countries. Notably, Hering and Paillacar (2016) highlight the importance of foreign demand beyond the price and quantity channels for the location choice of individuals in Brazil.

We measure these changes in local export opportunities by an indicator of foreign demand. This indicator, which varies across localities and years, is a function of the product-level demand from foreign trade partners and the initial export structure of Chinese localities. Changes in this indicator therefore only reflect exogenous shocks that are independent of local economic, technological and societal changes.

Our contribution is threefold. We first add to the literature exploring the determinants of life satisfaction in China. That the happiness of the millions of Chinese extracted from poverty in a few decades has not grown significantly remains a puzzle for economists and sociologists alike. The existing literature puts forward a number of macro factors, such as the dismantling of safety nets (Easterlin et al., 2012), the growing frustration associated with the emergence of a more individualistic and unequal society (Bartolini and Sarracino, 2015), or environmental degradation (Zhang et al., 2017). We complement this list of macro factors, highlighting, by way of contrast, the role of another factor that leads to rising Chinese life satisfaction.

Second, we explore the channels through which trade shocks impact individual well-being. A recent and somewhat sparse literature shows that economic changes affect well-being beyond their associated change in income (Pierce and Schott, 2016b; Hummels et al. 2016 etc). We push this agenda forward by investigating the impact of an exogenous shock to the local labor market from changing export opportunities. We furthermore consider the possibility that the well-being effects from greater international demand diffuse throughout the household.

Finally, we contribute to the literature on the "China Syndrome". We evaluate the social consequences of the emergence of Chinese trade from a diametrically-opposed perspective. In addition to the work that has assessed the impact on importing countries, we here analyze the consequences for those living in the exporting locations. By exploring the other side of the coin we contribute to a more comprehensive assessment of the well-being repercussions of globalization at the world level.

Overall, our results show that greater export opportunities improve Chinese life satisfaction. This effect goes beyond the rise in individual wages and employment opportunities, and is also found for those who do not work. The size of the estimated impact is far from negligible: controlling for any potential effects on income and health, rising export opportunities explain around 15% of the observed increase in life satisfaction in China over the 2010-2014 period, depending on the specification. This is more than twice as large as the contribution of personal income growth. However, the effect we observe is not disconnected from the labor market. We first find a much stronger positive effect of export opportunities on job satisfaction than on family-life satisfaction. Second, we find that greater local export opportunities benefit urban more than rural dwellers, which is consistent with most Chinese exports coming from cities, with only a very small fraction of agricultural goods. While we logically find larger gains for those most likely to benefit from greater export opportunities, we also establish that these non-monetary gains are shared within the entourage of those who are directly affected, with higher life satisfaction for family members who do not work as a function of the number of active people in the household. These positive effects via the labor market are not offset by worsening worker health. We find no evidence of the worse physical and mental health following greater

exposure to international markets that was proposed by Hummels et al. (2016).

The remainder of the paper is structured as follows. Section 2 describes the data used to evaluated life satisfaction in China. Section 3 presents our measure of local export opportunities, and Section 4 the empirical specification relating life satisfaction to export opportunities. Section 5 presents the baseline results and runs a variety of robustness checks, and Section 6 elaborates on the channels that are at play. Last, Section 7 concludes.

## 2. Life satisfaction surveys

We draw on data from the China Family Panel Studies (CFPS), a nationally representative survey of Chinese communities, families, and individuals launched in 2010 by the Institute of Social Science Survey (ISSS) at Peking University.[7] The whole Chinese territory was covered apart from six peripheral provinces (Xinjiang, Tibet, Qinghai, Inner Mongolia, Ningxia and Hainan).[8] The 2010 baseline survey of nearly 15,000 households and 25,000 adult family members was followed by two follow-up surveys in 2012 and 2014, hence providing one of the first large-scale panel survey projects focusing on family and society in China (Xie and Hu, 2014).[9] Face-to-face interviews focus on economic and non-economic well-being and collect information on demographic characteristics (age, gender, marital status, number of children, place of residence, level of education, health etc.) as well as answers to many questions on economic activities, well-being, family relationships and lifestyle habits.

The sample after eliminating inconsistent observations (regarding respondent age and gender) and missing responses for the key variables (demographics, household income and life satisfaction) contains information on 27,174 individuals aged over 16 years across 125 prefectures.[10] Table A-1 provides summary statistics for the key variables in the sample used in our baseline regression. The sample is equally divided between men and women, with a median age of 47. 71% of those aged 65 and below say that they work.

The majority of respondents live in the countryside (55%). Among urban dwellers (according to the Census Bureau's definition of the corresponding year) 43% maintain an agricultural household registration ("hukou"), which is a traditional indicator of being rural-urban migrants.[11] Almost all respondents are in couples (87%), with an average number

[7] This is funded by the 985 Program of Peking University (http://www.isss.edu.cn/cfps/EN/).

[8] These peripheral provinces are large in size but relatively sparsely populated: they contain only six per cent of the national population.

[9] http://www.isss.edu.cn/cfps/EN/. The CFPS used a multi-stage probability proportional to the sample size with implicit stratification to reduce the operational cost of the survey and better represent Chinese society. All sub-samples were obtained in three stages. In the first stage, the primary sampling unit was either an administrative district (in urban areas) or a county (in rural areas), in the second stage it was either a neighborhood community (in urban areas) or an administrative village (in rural areas), and in the third and final stage the unit corresponded to the household.

[10] The localities here are defined at the 4-digit level of the Chinese spatial-coding system. This is the prefecture level, the level below the province. China is divided into 4 municipalities (Beijing, Tianjin, Shanghai and Chongqing) and 27 provinces, which are further divided into 334 prefectures.

[11] The sample however only includes very few individuals who migrated between 2010 and 2014, due to the difficulty of maintaining contact with them after they move. The CFPS resorts to telephone interviews

of children of 1.86.[12]

Regarding income, we exploit two difference pieces of information. The first is total individual income. Unfortunately, this variable contains many missing values. In addition to all those who do not work, almost half of respondents who say they have a job do not declare their income in the survey. The second is per capita household income (total declared household income divided by the number of household members[13]). This information has far fewer missings and is consistent with macroeconomic data. Average household income per capita in 2014 for rural respondents is 9,890 Yuan, which is exactly the figure for net income per capita in rural households published in the China Statistical Yearbook. The average per capita family income in urban households is 22,402 Yuan,[14] highlighting the urban-rural divide in China (Piketty et al., 2017). Following other work on CFPS data (Zhang et al., 2017), we complement this information with the answers to a personal question on relative income. Individuals were asked how their income[15] compares to that in their local area on a scale of 1 to 5, with 1 and 5 indicating very low and very high respectively.

The surveys contain a number of questions about individual well-being. Unfortunately, most are not asked systematically across all three waves.[16] Our main variable of interest will therefore be the question on life satisfaction, which is the only one appearing in all three waves. Respondents are asked "*How satisfied are you with your life?*", with answers on a scale of 1 (very dissatisfied) to 5 (very satisfied). This measure of well-being, without any explicit time reference, is an overall assessment of life (Deaton and Stone, 2013). The replies thus take into account the extent to which the respondent's personal experience matches their long-term aspirations and expectations, and are less affected by recent emotions and emotional shocks (Stone and Mackie, 2014).

As indicated in Appendix Table A-1, mean life satisfaction in our sample is 3.52, with a standard deviation of 1.06. Average life satisfaction fell from 3.47 in 2010 to 3.31 in 2012 before rising to 3.81 in 2014. These levels and the upward trend between 2010 and 2014 are consistent with the results of other (much-smaller) surveys, including the World Values Survey, Gallup, and the Chinese General Social Survey (see Easterlin et al., 2017, for a comparison and discussion). The CFPS data used here cover a much larger population

in addition to face-to-face interviews to mitigate attrition problems. However, only 95 individuals in the CFPS sample report a change in location (at the 4-digit level at which export opportunities are measured) from one survey to another. Almost half of these are finally excluded from our baseline specification, which includes fixed effects and controls, either because they are only present for one year or because some key variables are missing.

[12]The "one-child" policy implemented in 1979 only applied to a minority of the population, typically urban residents and government employees (Hesketh et al., 2005). Rural households, which account for about two-thirds of the population, were generally allowed to have several children under certain conditions.

[13]We have carried out robustness checks using different weights for adults and children: the results are not significantly affected.

[14]This is below the official figure of 29,381 Yuan reported for urban households' per capita net disposable income in the China Statistical Yearbook.

[15]The question does not include an exact definition of income, and family members without a job or personal income also answered.

[16]For instance, the 2010 questionnaire includes questions on satisfaction with some specific aspects of work (remuneration and promotion) but these are not included in the following years' questionnaires. In addition, a question on satisfaction with family life appears in 2012.

across China, with individuals being followed over time and including information on a variety of demographic characteristics and location, which is key for our analysis.

The map in Figure 1 shows average life satisfaction in 2014 for our sample locations. There is considerable heterogeneity. Interestingly, the lowest level of well-being (just over 3) is found in three prefectures (Zhanjiang, Yangjiang and Meizhou) in Guangdong Province, which is the richest province in China. Average life satisfaction levels are above 4.15 in three prefectures in three different provinces (Dezhou in Shandong, Kaifeng in Henan and Yuxi in Yunnan). The map suggests that life satisfaction is on average higher in the inland provinces. This contrasts with the well-established income gradient based on distance to the coast and the central role of geography in China. From East to West in China, the richer fertile, urbanized areas characterized by plains give way to poorer areas with first plateaus and then high arid desert and mountains. The apparent lack of correlation between individual life satisfaction and local economic conditions is in fact consistent with the literature highlighting the individual sources of life satisfaction, such as having a partner and physical and mental health (Clark et al., 2017). GDP per capita and local average household income per head explain only a very small share of the variance in well-being. Variance decomposition reveals that only 4.7% of the variance in 2014 life satisfaction comes from local conditions, as compared to 95.3% from differences between individuals within locations.

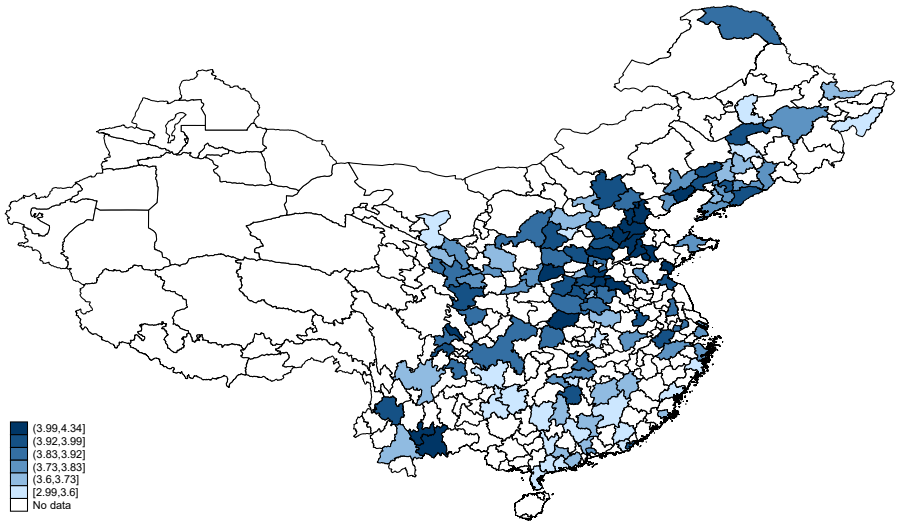


**Figure 1 – Average 2014 life satisfaction by 4-digit location (Source CFPS, scale 1=very low to 5=very high)**

## 3. Local export opportunities

The analyses of the "China syndrome", initiated by Autor et al. (2013), aim to estimate the impact of China's export-capacity growth on employment, welfare and policy choices in developed countries. Symmetrically, we here ask how the well-being of those living in a given Chinese locality reacts to a globalization shock, and more specifically to a change in export opportunity. As noted above, in order to limit endogeneity biases our identification does not rely on total exports from each Chinese locality; we instead construct a location-specific indicator that captures the change in import demand from foreign countries across Chinese localities over time.

Even though world demand and Chinese exports grew continuously between 1990 and 2014 (except for the crisis in 2009), this growth was not uniform across China. Over time, different Chinese localities experienced distinct shocks due to their sectoral specialization and geographical orientation of their trade. Our variable of interest here measures the potential foreign demand addressed to each Chinese locality, explicitly taking into account these two dimensions. It thus picks up changes in export opportunities that are exogenous to the local factors affecting overall export capacity in a given location, such as the number of exporting firms, locally-available technology and local trade frictions with particular trade partners. We define the export opportunities for each Chinese locality $c$ in year $t$, $ExOp_{ct}$, as follows:

$$ExOp_{ct} = \sum_{dk} w_{cdkt_0} M_{dkt}, \tag{1}$$

where $M_{dkt}$ denotes the import demand for product $k$ in foreign country $d$ in year $t$, and $w_{cdt_0}$ is the share of exports of product $k$ to country $d$ in total exports ($EX$) for Chinese locality $c$ in baseline year $t_0$: $w_{cdkt_0} = (EX_{cdkt_0} / \sum_{dk} EX_{cdkt_0})$. The $ExOp$ indicator is then a weighted average of foreign demand, weighting the import demand for product $k$ from each potential importing country $d$ by the initial share of this product-destination flow in location $c$'s total exports.

The weights $w_{cdkt_0}$ are calculated from 2008 Chinese custom data (i.e. two years before the first wave of the CFPS). We estimate country-product import demand, $M_{dkt}$, from a structural gravity equation (Head and Mayer, 2014):

$$EX_{odkt} = \phi_{odkt} S_{okt} M_{dkt} = \phi_{odkt} \underbrace{\frac{Y_{okt}}{\Pi_{okt}}}_{S_{okt}} \underbrace{\frac{E_{dkt}}{P_{dkt}}}_{M_{dkt}}, \tag{2}$$

where $EX_{odkt}$ denotes the bilateral export flow of product $k$ from the origin country $o$ to destination country $d$ in year $t$. In this equation, $\phi_{odkt}$ reflects the accessibility of market $d$ for the exporters of good $k$ in location $o$. It is an inverse measure of bilateral trade barriers. The supply capacity of the exporting country, $S_{okt}$, and the market capacity of the importing country $d$, $M_{dkt}$, capture all the elements that make exporter $o$ a competitive exporter of good $k$ and partner $d$ an attractive destination for good $k$. More precisely, the demand factor $M_{dkt}$ depends on location $d$'s total expenditure on good $k$, $E_{dkt}$, and the prevailing price index on market $d$ for good $k$, $P_{dkt}$. The supply capacity, $S_{okt}$, on the contrary reflects production capacity $Y$ and price competitiveness $\Pi$.

Following Redding and Venables (2004), we obtain the demand factors $M_{dkt}$ from the estimation of Equation 2 in log form:

$$\ln EX_{odkt} = \ln \phi_{odkt} + \ln S_{okt} + \ln M_{dkt} + u_{odkt}, \tag{3}$$

where $u_{odkt}$ is an error term. In this equation we proxy $\phi_{odkt}$ by a vector of the standard determinants of trade costs between $o$ and $d$:

$$\phi_{odkt} = [(d_{od})^{\alpha^1_{kt}}(B_{od})^{\alpha^2_{kt}}(RTA_{odt})^{\alpha^3_{kt}}(WTO_{odt})^{\alpha^4_{kt}}]$$

.

Here, $d_{od}$ is the bilateral distance between $o$ and $d$,[17] $B_{od}$ a dummy for the partners sharing a common border, $RTA_{odt}$ a dummy for a free-trade agreement between the two trading partners in year $t$, and $WTO_{odt}$ a dummy for the two being members of the WTO in year $t$. We estimate Equation 3 separately for each year of our sample (2010, 2012 and 2014) and each of the 2-digit products in the Harmonized System using a trade data set including international trade flows between all 184 countries that record exporting and importing in every year during the sample period (excluding China).[18] The log of importer market capacity ($\ln M_{dkt}$) and the log of exporter supply capacity ($\ln S_{okt}$) for good $k$ are captured by importer-product and and exporter-product fixed effects. By estimating this equation separately for each year, all of the coefficients $\alpha^1$ to $\alpha^4$ and the fixed effects vary over time and product. The importer fixed effects, $\widehat{\ln M_{dkt}}$, are then used to construct our measure of export opportunities, $ExOp_{ct}$, for Chinese locations.

The map in Appendix Figure A-1 shows our export-opportunity variable for each prefecture in 2012. The top four cities in terms of export opportunities are from Shanxi (Luliang, Datong and Yuncheng) and Shaanxi (Yulin), which are all in the center region, whereas export opportunities are lowest in the Western region (Wuwei and Linxia in Gansu and Longnan and Dali in Yunnan). The correlation between the log of Export Opportunity and the log of exports in 2012 is 0.39, indicating that our exogenous indicator likely captures well the heterogeneity in exports across China. Data on exports at the prefecture level are unfortunately not available to us after 2012. Figure A-2 reveals a positive relationship between the yearly changes in our exogenous indicator of export opportunities and location total exports over the 2009-2012 period. Between 2010 and 2014, we find an average rise in export opportunities of 65%, which is consistent with the observed increase in Chinese exports of about 48% over this period. To provide a first glimpse of the relationship between life satisfaction and our indicator, Appendix Figure A-3 shows that there is a positive correlation between local changes in export opportunities and average life satisfaction between 2010 and 2014.

## 4. Empirical specification

Our benchmark specification is an individual fixed-effect estimation that relates the life satisfaction reported by individual $i$ living in location $c$ to the local export opportunities in this location using three years of panel data from 2010, 2012 and 2014:

$$\text{Life satisfaction}^i_{ct} = \beta \ \ln \text{ExOp}_{ct} + \gamma Z^i_t + \gamma W_{ct} + \lambda^i + \mu_{pt} + \epsilon^i_{ct} \qquad (4)$$

Here $\text{Life satisfaction}^i_{ct}$ denotes the self-assessed life satisfaction of individual $i$ in location $c$ in year $t$, $\lambda^i$ is an individual fixed effect and the vector $Z^i_t$ contains individual char-

[17] The distance between exporters and importers is defined as the great circle distance between the main cities of the two countries. The data come from the CEPII website.

[18] The trade data come from BACI, the World trade database developed by CEPII.

acteristics that vary over time. Following the literature (Oswald, 1997; Knight et al., 2009; Knight and Gunatilaka, 2010; Easterlin et al., 2012), this latter includes age,[19] age-squared, being of working age (below age 66), marital status, the number of children, health conditions,[20] urban residency, rural-to-urban migrant, having a non-agricultural hukou and a range of variables on income and employment: the log of family income (per capita), perceived relative income status, and the type of job (salaried job, self-employed in a non-agricultural business or informal agricultural work for the family business). A number of these variables, such as income and health, will potentially also be affected by local export opportunities, and will thus capture the indirect effect of changes in international demand on life satisfaction. We will look explicitly at the impact of export opportunities on these variables in Sections 5.1 and 6.2.

The vector $W_{ct}$ includes standard local macroeconomic variables that are potentially correlated with export opportunities. We notably control for income per capita, foreign direct investment received, industry specialization, population density and air pollution. The $\mu_{pt}$ are a full set of province dummies interacted with time dummies to pick up macro-economic shocks. Our coefficient of interest, $\beta$, thus identifies the effect of Export Opportunities on life satisfaction based on the variations between prefectures within a given province in a given year.

Finally, $\epsilon^{i}_{ct}$ is the usual error term. Standard errors are clustered at the location-year level to account for the correlation between individuals within a given locality and year, which is the dimension of our explanatory variable of interest.[21]

Our specification may provoke a number of legitimate concerns. First, answers to questions asking individuals to report their subjective well-being in a few ordered categories are not without problems. One concern is that of scaling, since mental scales may vary across individuals (one person's 5 may correspond to another's 4). Our study estimates that follow the same individual's satisfaction over time are however less subject to this concern. Another issue is that well-being is intrinsically ordinal and hence should not be treated as cardinal. Moreover, using such scales to rank overall well-being across groups typically requires strong auxiliary assumptions (Bond and Lang, 2018). The ordered-logit estimator was specifically developed to handle this kind of dependent variable. In practice, this approach cannot be applied due to our two sets of large fixed effects (at the individual and province-year level).[22] Ferrer-i-Carbonell and Frijters (2004) review the econometric methods for the estimation of the determinants of happiness, and show that assuming the ordinality or cardinality of happiness scores actually makes little difference. However, they do emphasize that omitting individual fixed-effects will likely substantially affect the results. Our benchmark specification is therefore a fixed-effect regression of the cardinal life-satisfaction scores. However, Section 5.3 will present a series of robustness

[19] We include age as the different rounds of the survey are not always conducted at the exact same moment of the year, allowing the age variable to be identified separately from the individual fixed effect.

[20] Respondents rate their health status on a five-point scale with 1 denoting excellent and 5 very poor health. To facilitate interpretation, we invert this scale so that higher numbers indicate better health.

[21] Note that our main results hold also when standard errors are clustered at the location level. These results are available upon request.

[22] In Section 5.3, we show however that our results hold in an ordered logit estimation using a reduced specification without the province-year fixed effects.

checks, showing that the results continue to hold using a binary dependent variable for high satisfaction or a rise in satisfaction in a first-difference model.

Second, fixed-effect estimators and first differencing are two alternative ways of accounting for individual time-invariant characteristics, the $\lambda^i$ in Equation 4. We prefer the fixed-effect model as the first-difference estimator imposes a sampling restriction (it requires respondents to be observed in two consecutive periods). We nevertheless show in Section 5.3 that the estimates using the two methods are very similar.

## 5. Baseline results

Better export opportunities may raise life satisfaction due to the associated monetary gains. As our objective here is to determine whether their impact goes beyond this income channel, our baseline specification will include controls for income. Before showing the estimation results for Equation 4, we assess the impact of export opportunities on individual income and labor-market outcomes.

### 5.1. Price and quantity effects: The impact of export opportunities on employment and income

Logically, better export opportunities should foster job creation and raise wages. These quantity and price channels are certainly the most obvious ones linking export shocks to life satisfaction. However, we do not carry out a detailed microeconomic analysis of these channels, as this would require the precise identification of the workers who are exposed to these shocks. Our goal is instead to estimate the impact of trade shocks on the entire prefecture population, which includes a number of labor force non-participants and workers in the non-traded sector.[23]

Table 1 assesses how export opportunities affect three different labor-market outcomes. The first is a simple dummy for the respondent having a job (the quantity effect). The two others are related to earnings (the price effect): the income reported by the respondent and per capita household income (total household income divided by the number of household members). The estimated equation is similar to Equation 4, but now with labor-market participation and income as the dependent variable instead of life satisfaction.

We do not expect to find a large impact of export opportunities on employment (the quantity effect), due to the relatively low level of unemployment in China. Only 1.2% of respondents declare themselves to be unemployed. It is moreover very likely that, in the context of China's strong economic growth, employment status primarily reflects individual employability (via health conditions or age) or personal decisions related to marital and family status (e.g. individuals - often women - may decide to withdraw from the labor market to raise children or care for their elderly relatives). In line with our prior, in Column 1 there is no significant association between export opportunities and the probability of having a job.

[23] There is very little information in our data that would allows us to calculate individual exposure to exports. We mostly do not know in which type of firm individuals work, and industry information is very aggregated and often missing.

We do not expect a very strong price effect either. Better export opportunities should of course logically drive wages up. But Chinese exports still rely heavily on price competitiveness and internal migration mitigates wage rises for low-skilled workers. As such, the existing literature finds that the link between exports and wages in Chinese labor markets is only tenuous. Hering and Poncet (2010), who exploit detailed data on about 6,000 Chinese workers, show that workers in cities with better access to domestic and international markets do receive higher wages. But this effect is strong and robust to the inclusion of local living costs only for high-skilled workers. Yao and Zhong (2013) find that the firm-level average wage falls with the share of exports in total sales. Fu and Wu (2013), who use more detailed data, find that Chinese exporters tend to offer higher average wages than do non-exporters. But this average wage premium is small and is driven by a small number of industries and regions, and the authors conclude that the wage premium from exports is not a prevailing phenomenon in China. Chen et al. (2011) show that the presence of foreign firms in a Chinese region has a significant negative impact on wages in domestic firms and discourages wage growth in these firms.

The results in Table 1 confirm the weakness of the relationship between exports and wages. The best variable for the analysis of the price effect would, a priori, be individual income. However, as noted above, this only applies to respondents with personal earnings (wages, pensions or capital income) and excludes those without personal incomes (students, homemakers and the retired without pensions). A greater problem is that individual income is very badly reported in the surveys, with valid responses for only 53% of the total sample and 57% of the sub-sample of respondents with a job (most people working in the agricultural family business do not report individual incomes).[24] The results in Column 2, based on the sub-sample with non-missing individual income, reveal that export prospects have a significant (but imprecisely-estimated) positive effect on individual earnings. This effect is not very strong, but not negligible either. As reported in Appendix Table A-1, export opportunities rose by about 65% on average between 2010 and 2014. Our estimates imply that individual incomes in prefectures with this average improvement in export opportunities rose by 4.3% compared to those in cities with no export growth.

The second income indicator we use is household income per capita. Unlike individual income, this variable is well-reported in the three survey waves. More importantly, given solidarity within households, this is best able to capture the monetary channel for happiness. In the Chinese Socialist and patriarchal cultural context, many decisions do not solely reflect the individual's prerogatives but also those of the household. This household-level decision-making hence makes household income per capita a pertinent proxy for earnings at the individual level, notably for those without personal income. This allows us to consider the whole sample, irrespective of their individual income information: this is essential to determine whether export opportunities only matter for the economically-active or, on the contrary, also have repercussions on others. However, this variable is much less closely-connected to direct labor-market outcomes, and is thus less likely to be significantly affected by local export opportunities. This is confirmed by the insignificant coefficient in Column 3 of Table 1.

[24] Our income variables appear in nominal terms. The inclusion of province-year fixed effects in our regressions controls for different developments in prices and living costs across provinces.

**Table 1 – Export opportunities and labor-market outcomes**

| Dependent variable | Has job | Ln income | Ln family income per capita |
|---|---|---|---|
| | (1) | (2) | (3) |
| ln $ExOp_{ct}$ | 0.019 | 0.073$^c$ | -0.050 |
| | (0.024) | (0.040) | (0.041) |
| Individual controls | Yes | Yes | Yes |
| Basic macroeconomic controls | Yes | Yes | Yes |
| Individual fixed effects | Yes | Yes | Yes |
| Province-year fixed effects | Yes | Yes | Yes |
| No. of prefectures | 125 | 125 | 125 |
| $R^2$ | 0.587 | 0.723 | 0.645 |
| Observations | 56,356 | 26,727 | 77,735 |

Heteroskedasticity-robust standard errors clustered at the prefecture-year level appear in parentheses. $^a$, $^b$ and $^c$ indicate significance at the 1%, 5% and 10% confidence levels respectively. The individual control variables are age, age-squared, health, urban dummy, agriculture hukou dummy, rural-urban migrant dummy, in couple dummy, number of children, and Communist Party membership. Columns 2 and 3 further include having a salaried job, self-employed with non-agricultural business, working in own agriculture family business, and a working-age dummy. The basic macroeconomic controls are ln GDP per capita, ln value added in primary industry and ln value added in secondary industry at the prefecture level. The sample in Column 1 for the probability of having a job is restricted to respondents aged 65 or below.

## 5.2. Quality effect: The impact of export opportunities on life satisfaction

We now focus on the quality effect and ask whether export opportunities affect life satisfaction, beyond any indirect effect transiting via the main individual determinants of happiness, including income. Table 2 reports the results of Equation 4. The use of individual fixed effects implies that individual time-invariant characteristics (sex, social and cultural background, education etc.) are controlled for, so that the estimated coefficients on the time-varying indicators inform us about the effect of a change in the individual's situation (regarding income, family structure, health, economic environment etc.) on the change in their well-being.

Column 1 regresses life satisfaction only on the individual and family demographic variables that have been found to be important correlates of life satisfaction in previous work, notably age, marital status, type of employment, party membership, health and income (Oswald, 1997; Knight et al., 2009; Easterlin et al., 2012). Our results confirm the importance of family composition for individual life satisfaction. Forming a couple is associated with a 0.18 point increase in life satisfaction. Having a new child, on the other hand, brings about lower well-being. This result, which is paradoxical at first sight, can be explained by the relatively short time horizon over which the evolution of well-being is measured. The inconveniences (lack of sleep, worries, additional expenses etc.) experienced by parents in the first few months of a newborn's life more than outweigh the initial happiness from having a child (Myrskylä and Margolis, 2014; Glass et al., 2016).[25] All else equal, well-being does not react to reaching retirement age (over 65) or taking or leaving a job. Becoming a Communist Party member atracts a positive significant

[25] The negative link between life satisfaction and parenthood continues to hold when using a dummy for having a child and accounting for the sex of the children.

coefficient, which may suggest that this represents a consecration for an individual. The various proxies for changes in an individual's place of residence, the conversion of *hukou*[26] and the modification of urban/rural status (set by the Census Bureau) of the place of residence, do not appear to affect life satisfaction. The dummy for living in a city but retaining a rural hukou, which is the standard definition of a rural-urban migrant in China (Wang, 2017), attracts the expected negative (albeit insignificant) coefficient (Knight and Gunatilaka, 2010).[27]

Two additional factors stand out as predictors of well-being: health and income. Higher self-assessed health scores (on a 1 to 5 scale) are consistently associated with higher life satisfaction. Around 72% of respondents report good to excellent health, compared to 15% for fair (score 2) and 13% for bad (score 1). The latter proportions obviously partly reflect age-related illnesses (those over 60 account for 21% of the sample and report significantly lower average health scores). Nevertheless, the data reveal a marked worsening of health: between 2010 and 2014, as the average health score fell from 4.17 to 2.95. Based on the point estimates in Column 2, this 1.2 point decline in perceived health reduced well-being by 0.103 points.

The income measure in Columns 1 to 4 is household income per capita, which attracts a very significant positive estimated coefficient. Better material conditions do then make people happier. In Columns 5 and 6, we check the robustness of this finding to the use of individual income, which mechanically restricts the sample to individuals who declare a strictly positive value for this variable. Our previous results continue to hold, as individual income attracts a positive significant coefficient.[28] However, the coefficients on both income variables are quite small, suggesting an only limited impact of income growth on life satisfaction (see below for a detailed quantification of our results). In line with the literature underlining the central role of relative income (Clark et al., 2017), self-rated relative income also attracts a positive significant coefficient. From the estimated coefficient in Column 4, a one-point rise in relative income (on a scale of 1 to 5) is associated with life satisfaction that is 0.18 points higher.

From Column 2 onwards we include local export opportunities, and find that these have a significant positive impact on the local population's life satisfaction.

Before we discuss the coefficient in more detail, we ensure in Columns 3 and 4 that the positive link between export opportunities and life satisfaction is not simply picking more favorable local economic conditions by adding a set of macroeconomic variables. As most of these latter are not available for the full set of our prefectures, we limit the additional macroeconomic controls in Column 3 to the three proxies for local economic structure that we could obtain for all prefectures in our sample: Ln GDP per capita, Ln Value-Added from manufacturing and Ln Value-added from the primary sector.[29] Column 4, which

[26] The *hukou* system is a governmental household-registration system that practically limits where a person is allowed to live, especially for those born with an agricultural (rural) hukou.

[27] The literature indicates that rural-urban migrants in China experience a fall in perceived status and hence perceived well-being as the reference group changes from the poorer countryside community to the richer urban society.

[28] Table B-1 in appendix shows a series of robustness tests that confirm that this finding holds whatever indicator is used to measure income.

[29] These macro-level indicators at the (4-digit) location level come from China Data Online at the University

**Table 2 – Life satisfaction and export opportunities: Baseline results (Equation 4)**

| Dependent variable | Life satisfaction of individuals (2010, 2012, 2014) | | | | | |
|---|---|---|---|---|---|---|
| Sample | All | | | | Pos. personal income | |
| | | | | Benchmark | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ln $ExOp_{ct}$ | | 0.073$^{b}$ | 0.069$^{b}$ | 0.078$^{a}$ | 0.092$^{a}$ | 0.092$^{a}$ |
| | | (0.029) | (0.029) | (0.028) | (0.032) | (0.034) |
| Ln family income (per capita)$^{i}_{t}$ | 0.018$^{a}$ | 0.018$^{a}$ | 0.018$^{a}$ | 0.020$^{a}$ | | |
| | (0.006) | (0.006) | (0.006) | (0.007) | | |
| Ln personal income$^{i}_{t}$ | | | | | 0.027$^{a}$ | 0.033$^{a}$ |
| | | | | | (0.008) | (0.009) |
| Perceived relative income score$^{i}_{t}$ | 0.180$^{a}$ | 0.180$^{a}$ | 0.180$^{a}$ | 0.180$^{a}$ | | |
| | (0.007) | (0.007) | (0.007) | (0.007) | | |
| Salaried job$^{i}_{t}$ | -0.017 | -0.017 | -0.017 | -0.023 | -0.020 | -0.008 |
| | (0.016) | (0.016) | (0.016) | (0.017) | (0.023) | (0.024) |
| Self-employed$^{i}_{t}$ | 0.022 | 0.023 | 0.023 | 0.020 | -0.023 | 0.009 |
| | (0.021) | (0.021) | (0.021) | (0.022) | (0.044) | (0.048) |
| Ag. work for family business$^{i}_{t}$ | -0.004 | -0.005 | -0.006 | -0.007 | -0.024 | -0.005 |
| | (0.019) | (0.018) | (0.018) | (0.020) | (0.032) | (0.033) |
| Health status$^{i}_{t}$ | 0.086$^{a}$ | 0.086$^{a}$ | 0.086$^{a}$ | 0.088$^{a}$ | 0.108$^{a}$ | 0.117$^{a}$ |
| | (0.006) | (0.006) | (0.006) | (0.006) | (0.009) | (0.010) |
| Age$^{i}_{t}$ | 0.100 | 0.097 | 0.096 | 0.115 | 0.043 | 0.050 |
| | (0.076) | (0.075) | (0.076) | (0.078) | (0.137) | (0.137) |
| Age-squared$^{i}_{t}$ | 0.000 | 0.000 | 0.000 | 0.000 | 0.001$^{a}$ | 0.000$^{a}$ |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Working age$^{i}_{t}$ ($\leq$ 65) | 0.000 | -0.001 | -0.001 | -0.004 | -0.010 | -0.011 |
| | (0.024) | (0.024) | (0.024) | (0.024) | (0.048) | (0.054) |
| Non-agricultural Hukou$^{i}_{t}$ | -0.025 | -0.026 | -0.026 | -0.026 | -0.103 | -0.073 |
| | (0.043) | (0.043) | (0.043) | (0.044) | (0.079) | (0.085) |
| Urban$^{i}_{t}$ | -0.000 | 0.003 | 0.002 | 0.012 | 0.004 | -0.036 |
| | (0.062) | (0.061) | (0.062) | (0.064) | (0.108) | (0.119) |
| Rural-Urban migrant$^{i}_{t}$ | -0.075 | -0.076 | -0.077 | -0.077 | -0.130 | -0.123 |
| | (0.051) | (0.051) | (0.051) | (0.052) | (0.085) | (0.092) |
| ln couple$^{i}_{t}$ | 0.182$^{a}$ | 0.183$^{a}$ | 0.183$^{a}$ | 0.193$^{a}$ | 0.244$^{a}$ | 0.263$^{a}$ |
| | (0.032) | (0.032) | (0.032) | (0.033) | (0.046) | (0.048) |
| Number of children$^{i}_{t}$ | -0.061$^{a}$ | -0.061$^{a}$ | -0.061$^{a}$ | -0.069$^{a}$ | -0.095$^{b}$ | -0.096$^{b}$ |
| | (0.023) | (0.023) | (0.023) | (0.026) | (0.038) | (0.040) |
| Communist Party member$^{i}_{t}$ | 0.081$^{c}$ | 0.082$^{c}$ | 0.082$^{c}$ | 0.075$^{c}$ | 0.076 | 0.085 |
| | (0.042) | (0.042) | (0.042) | (0.044) | (0.064) | (0.074) |
| Ln GDP per capita$_{ct}$ | | | 0.134 | -0.079 | | 0.060 |
| | | | (0.133) | (0.267) | | (0.361) |
| Ln VA manuf ind$_{ct}$ | | | -0.129 | -0.048 | | -0.175 |
| | | | (0.140) | (0.164) | | (0.216) |
| Ln VA primary ind$_{ct}$ | | | 0.271 | 0.294 | | -0.176 |
| | | | (0.177) | (0.184) | | (0.241) |
| Ln Import competition$_{ct}$ | | | | -0.005 | | -0.022 |
| | | | | (0.015) | | (0.018) |
| Ln Population density$_{ct}$ | | | | 0.517$^{c}$ | | 0.596 |
| | | | | (0.291) | | (0.368) |
| FDI over GDP$_{ct}$ | | | | 0.000 | | -0.001 |
| | | | | (0.001) | | (0.001) |
| Manufacturing employment share$_{ct}$ | | | | 0.106 | | 0.331$^{c}$ |
| | | | | (0.150) | | (0.201) |
| $SO_2$ emissions per capita$_{ct}$ | | | | 0.000 | | -0.000 |
| | | | | (0.000) | | (0.000) |
| | Individual and province-year fixed effects | | | | | |
| $R^2$ | 0.598 | 0.599 | 0.599 | 0.601 | 0.627 | 0.628 |
| No. of prefectures | 125 | 125 | 125 | 116 | 125 | 116 |
| Observations | 69,225 | 69,225 | 69,225 | 64,008 | 26,727 | 23,464 |

Heteroskedasticity-robust standard errors clustered at the prefecture-year level appear in parentheses. $^{a}$, $^{b}$ and $^{c}$ indicate significance at the 1%, 5% and 10% confidence levels respectively.

is our benchmark specification, adds five additional indicators of macro-level economic conditions. We first check that our story does indeed relate to export opportunities and not improved access to imports by including a proxy for import shocks (*Ln ImpComp*). This mimics *ExOp* but is calculated using the structure of imports of each Chinese locality and the supply capacities of foreign partners instead of the structure of exports and foreign destination countries' market capacities.[30] The other controls are Ln Population density, foreign direct investments (FDI) over GDP, manufacturing employment share, and local pollution (measured by $SO_2$ emissions per capita). Our findings for export opportunities hold, even though the inclusion of these additional variables produces a smaller sample, as these are not available for nine prefectures.

In contrast to the significant role played by export opportunities, none of these new controls attract significant coefficients, apart from the proxy for population density which has a positive significant coefficient at the 10% confidence level. In unreported results, we considered a great many other measures of local conditions using data from the China statistical yearbooks to ensure that our main finding of a positive and significant effect of export opportunities on life satisfaction was robust. We notably considered amenity variables (number of hospitals, number of schools of various levels and number of theaters), but none of these attracted significant coefficients. In general, none of the prefecture-level variables we introduced significantly altered the measured association between perceived life satisfaction and export opportunities, so that the positive significant association we find between life satisfaction and export opportunities does not reflect other local conditions.

We illustrate our results via two quantification exercises. We first compare the change in life satisfaction for individuals living in locations at the 25% and 75% percentiles of the distribution of changes in export opportunities. This corresponds to comparing locations whose export opportunities grew by 45.3% and 79.1% respectively between 2010 and 2014. Using the coefficient from our baseline regression (in Column 4 of Table 2), all else equal, average life satisfaction was about 0.027 units higher in a top-quartile compared to a bottom-quartile location. This difference may seem small, but should be compared to the (quite small) average variation in self-reported life satisfaction in China over this period. This estimated gap represents about 8.5% of China's average well-being growth between 2010 and 2014.

Another way of interpreting the magnitude of our estimates is to calculate the respective contributions of the average changes in $ExOp_{ct}$ and earnings to life satisfaction. These appear in Table 3. The mean change in the log of $ExOp_{ct}$ between 2010 and 2014, is about 63% in our benchmark sample. The estimated coefficient of 0.078 (column 4 in Table 2) suggests that this increase raised life satisfaction by 0.049. This represents about 15% of the overall increase in well-being reported over the period, which is 10 times larger than the contribution of changes in household income per capita. Calculating the respective contribution using the sample and estimation results based on individual incomes (Column 6 of Table 2) produces the same export-opportunities figure, and a slightly larger contribution from personal income (6.4%). Overall, the contribution of

of Michigan.

[30] Concretely we use $\widehat{S_{ot}}$ instead of $\widehat{M_{dt}}$ estimated from Equation 3 and adjust Equation 1 to calculate the weighted sum of the supply capacities of international partners, with the weights on the supply capacities being the share of the country $o$ - product $k$ pair in 2008 prefecture-level imports.

rising export opportunities remains much larger than that of income.

These findings, combined with the regressions shown in Table 1, suggest that the rise in well-being generated by increased export opportunities does not depend primarily on income: there is a direct significant link between export shocks and perceived quality of life. The following section will present a number of robustness tests, and then Section 6 will try to better understand the nature of this relationship.

**Table 3 – Quantification**

| | Sample A<br>With household inc. (Col. 4) | Sample B<br>With indiv. inc. (Col. 6) |
|---|---|---|
| Δ life satisfaction (2010-2014)<br>... Sample average | 0.32 | 0.36 |
| ... due to change in *ExOp*<br>... due to change in *ExOp* (% of total) | 0.049<br>15.3% | 0.057<br>15.8% |
| ... due to change in earnings (family/indiv)<br>... due to change in earnings (% of total) | 0.005<br>1.6% | 0.023<br>6.4% |

### 5.3. Robustness checks

Before analyzing the various channels through which export opportunities influence subjective well-being, this section provides some robustness checks of our findings above.

#### 5.3.1. Ordinal measures of life satisfaction

Our first robustness check concerns alternative measures of life satisfaction. Our aim here is twofold. We first address the use of a linear estimator for an ordered dependent variable. Second, we check that our results are not greatly affected by the choice of well-being variable, and consider the answers to an alternative question on happiness in the CFPS.

We cannot assume that as reported life satisfaction rises, from 1 to 3 say, the latent variable that expresses the "true" level of well-being triples. The nature of our dependent variable makes estimation via an ordered logit preferable. Unfortunately, our model includes two very large sets of fixed effects that prohibit the use of these estimators for our benchmark specification. To ensure nevertheless that results are comparable with such an estimator, in column 1 of Table 4, we show results from an ordered logit regression on a reduced specification with only one set of large fixed effects. We keep the individual fixed effects, but replace the province-year dummies with simple year dummies.[31] Even if we cannot control for macroeconomic shocks via province-year fixed effects, we still find a positive and significant effect of export opportunities on life satisfaction. However, as these variables are key to controlling at least partially for broader economic changes (p.ex. variation in the local price index) and changes in local institutions, we consider in Column 2 of Table 4 a Linear Probability Model (LPM) as an alternative to an ordered logit. Here, the dependent variable is transformed into a dummy denoting whether life satisfaction is above a certain threshold.

[31] We drop the 50 individuals in our benchmark specification that report changing the prefecture at one time over the sample. This way, we can cluster at the prefecture level with clusters nested within panels.

Column 2 of Table 4 replicates our baseline (Column 4 of Table 2) regression, with a dummy for high life satisfaction (of at least 4) instead of the score itself. The LPM estimate of the impact of export opportunities is positive and significant. The point estimate of 0.042 suggests that a 65% rise in access to foreign export markets (which corresponds to the average evolution over the period, as in Table A-1) would raise the probability of being "very satisfied" by 2.7 percentage points. This is non-negligible, and corresponds to roughly 22% of the average rise of 12 percentage points in this probability between 2010 and 2014. Note that the size of this estimate is also reasonably similar to that (15.4%) in our baseline regression in Table 3. Column 3 refers to a low-satisfaction dummy (a score of 1 or 2), which is negatively correlated with export opportunities.

**Table 4 – Life satisfaction and export opportunities: ordinal measure of well-being**

| Dependent variable | Satisfaction of individuals | | | | | |
|---|---|---|---|---|---|---|
| Indicator | Score 1-5 ordered logit | Dummy high satisfaction $\geq 4$ | Dummy low satisfaction $\leq 2$ | Happiness adjusted (1-5) | Dummy high happiness $\geq 4$ | Dummy low happiness $\leq 2$ |
| | | 2010 & 2014 | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ln ExOp | 0.120$^{c}$ | 0.042$^{a}$ | -0.018$^{b}$ | 0.068 | 0.032$^{c}$ | -0.020$^{b}$ |
| | (0.064) | (0.013) | (0.009) | (0.046) | (0.018) | (0.008) |
| | Time-varying individual and macroeconomic controls | | | | | |
| | Individual fixed effects | | | | | |
| Year f.e. | Yes | | | | | |
| Province-year f.e. | | Yes | Yes | Yes | Yes | Yes |
| No. of prefectures | 116 | 116 | 116 | 116 | 116 | 116 |
| $R^2$ | | 0.557 | 0.532 | 0.657 | 0.629 | 0.581 |
| Observations | 79777 | 64008 | 64008 | 33314 | 33314 | 33314 |

Heteroskedasticity-robust standard errors clustered at the prefecture (Col 1) or prefecture-year (Col 2-6) level appear in parentheses. $^{a}$, $^{b}$ and $^{c}$ indicate significance at the 1%, 5% and 10% confidence levels respectively. The individual control variables included are ln family income per capita, relative income score, having a salaried job, self-employed with non-agricultural business, working in own agriculture family business, age, age-squared, working-age dummy, health score, urban dummy, agriculture hukou dummy, rural-urban migrant dummy, in couple dummy, number of children, and Communist Party membership. The macroeconomic controls are (all at the prefecture level) ln GDP per capita, ln value added in primary industry and ln value added in secondary industry, ln Import Competition, ln Population density, FDI over GDP, Manufacturing employment share and $SO_2$ per capita.

The following columns (4 to 6) use the answers to a happiness question. The CFPS asks respondents to evaluate their happiness, although unfortunately the phrasing varies across surveys. While the questionnaire in 2010 asks "'Are you happy?" to which respondents could answer from very unhappy to very happy (coded 1 to 5), the question in 2012 was rephrased as "How often did you feel you were happy in the past week?" with 4 possible answers: "Almost never", "Sometimes", "Often" or "Most of the time". In 2014 the question reverted to that of 2010 but respondents had to rank their happiness using a scale of 0 to 10 (from very low (0) to very high (10)). We convert the 2014 10-point scale into the 2010 5-point scale using the following grouping: (0 and 1), (2 and 3), (4, 5 and 6), (7 and 8) and (9 and 10). We use this adjusted happiness score as the dependent variable in Column 4. The estimates thus come from 2010 and 2014 data only. In Column 5, we use a dummy variable for high happiness (4 or 5) and in Column 6 the dependent variable is a dummy for particular low happiness values (1 or 2). Our results reveal a positive association between export opportunities and happiness, consistent with our findings for

life satisfaction, and reveal significant well-being gains from higher demand-related export performance.

### 5.3.2. Alternative specifications

Table 5 ensures that our baseline results hold when using first differences as an alternative way of removing the fixed effects in Equation 4. Column 1 uses stacked first differences for two time periods, 2010 to 2012 and 2012 to 2014, while column 2 uses simple first differences for the four-year period 2010-14.[32] The first-difference estimator uses a smaller sample, as it only covers respondents who were present at both the start and end points of the periods considered.

In Columns 3 and 4, we estimate the following model, comparable to that in Autor et al. (2013):

$$\Delta \text{Life satisfaction}^{i}_{ct} = \beta \Delta \ln \text{ExOp}_{ct} + \gamma Z^{i}_{t} + \gamma W_{ct} + \mu_{pt} + \epsilon^{i}_{ct}. \quad (5)$$

Equation 5 estimates the impact of changes in local export opportunities on changes in life satisfaction (between $t$ and $t$+2), accounting for individual and local factors that may affect respondent well-being. The vector $Z^{i}_{t}$ includes individual demographic conditions, household income per capita, relative income score and employment and health status, measured at the start of each time period. The vector $W_{ct}$ contains again a variety of indicators of local economic conditions and industrial specialization in year $t$. $\mu_{pt}$ is a province-period fixed effect and $\epsilon^{i}_{ct}$ an error term.

The results in Table 5 are consistent and point to a positive association between demand from foreign partners and life satisfaction, regardless of the approach and whether a two- or four-year time window is used. The point estimates are not significantly different across the estimators.

As a last check in Table 6 we revert to the first-difference estimator, but rely on a dummy for life satisfaction rising over the period instead of the change itself. The specification here is hence similar to that in Column 1 of Table 5, except that the dependent variable is not $\Delta$Life satisfaction$^{i}_{ct}$ but a dummy for $\Delta$Life satisfaction$^{i}_{ct}$>0. Columns 1 and 2 use a linear probability estimator and Columns 3 and 4 a logit. Again a positive association is found between increased demand for local exports and rising life satisfaction. Relying on first difference is also an indirect test of the strict-exogeneity assumption for our variable of interest. The fixed-effect estimator requires strict exogeneity (no feedback from $\epsilon^{i}_{ct}$ to export opportunities) while the first-difference estimator requires a weaker form of strict exogeneity (allowing feedback which takes more than two periods). The finding of similar results from the two approaches suggests that endogeneity is not a key issue here (Wooldridge, 2010).

### 5.3.3. Sample checks

Table 7 asks whether the positive association between export opportunities and life satisfaction emanates from a particular location in China or is rather found throughout China

[32] We take the first difference of the dependent and all independent variables, except the province-year fixed effects, which we keep in levels. This allows us to control for different trends in growth rates across provinces.

**Table 5 – Life satisfaction and export opportunities: alternative approaches (1)**

| Dependent variable | Δ Life satisfaction of individuals | | | |
|---|---|---|---|---|
| Specification | First Difference of Equation 4 | | Equation 5 | |
| Time periods | 2010-12 &2012-14 | 2010-14 | 2010-12 & 2012-14 | 2010-14 |
| | (1) | (2) | (3) | (4) |
| Δ Ln $ExOp_{ct}$ | 0.084[a] (0.026) | 0.087[b] (0.040) | 0.098[a] (0.030) | 0.110[b] (0.048) |
| Individual and macroeconomic controls | Yes | Yes | Yes | Yes |
| Province-year f.e. | Yes | | Yes | |
| Province f.e. | | Yes | | Yes |
| $R^2$ | 0.108 | 0.044 | 0.086 | 0.014 |
| No. of prefectures | 115 | 114 | 115 | 114 |
| Observations | 35,900 | 13,802 | 35,900 | 13,802 |

Heteroskedasticity-robust standard errors clustered at the prefecture-year level appear in parentheses. [a], [b] and [c] indicate significance at the 1%, 5% and 10% confidence levels respectively. The individual control variables included are ln family income per capita, relative income score, having a salaried job, self-employed with non-agricultural business, working in own agriculture family business, age, age-squared, working-age dummy, health score, urban dummy, agriculture hukou dummy, rural-urban migrant dummy, in couple dummy, number of children and Communist Party membership. The macroeconomic controls are (all at the prefecture level) ln GDP per capita, ln value added in primary industry and ln value added in secondary industry, ln Import Competition, ln Population density, FDI over GDP, Manufacturing employment share and $SO_2$ per capita. Columns 1 and 3 use stacked first differences for two time periods, 2010 to 2012 and 2012 to 2014. Columns 2 and 4 use first differences for the four-year period 2010-14. In Columns 1 and 2 all individual and macroeconomic controls are included in first-differences; in Columns 3 and 4, these controls are measured at the start of each time period.

**Table 6 – Life satisfaction and export opportunities: alternative approaches (2)**

| Dependent variable | Δ Life satisfaction of individuals >0 | | | |
|---|---|---|---|---|
| Specification | LPM | | Logit | |
| Time periods | 2010-12 &2012-14 | 2010-14 | 2010-12 & 2012-14 | 2010-14 |
| | (1) | (2) | (3) | (4) |
| Δ Ln $ExOp_{ct}$ | 0.019[b] (0.008) | 0.017[b] (0.008) | 0.088[b] (0.039) | 0.069[b] (0.034) |
| Individual and macroeconomic controls | Yes | Yes | Yes | Yes |
| Province-year fixed effects | Yes | | Yes | |
| Province fixed effects | | Yes | | Yes |
| No. of prefectures | 115 | 114 | 115 | 114 |
| $R^2$ | 0.069 | 0.027 | | |
| Observations | 35,900 | 13,802 | 35,900 | 13,802 |

Heteroskedasticity-robust standard errors clustered at the prefecture-year level appear in parentheses. [a], [b] and [c] indicate significance at the 1%, 5% and 10% confidence levels respectively. The individual control variables included are ln family income per capita, relative income score, having a salaried job, self-employed with non-agricultural business, working in own agriculture family business, age, age-squared, working-age dummy, health score, urban dummy, agriculture hukou dummy, rural-urban migrant dummy, in couple dummy, number of children and Communist Party membership. The macroeconomic controls are (all at the prefecture level) ln GDP per capita, ln value added in primary industry and ln value added in secondary industry, ln Import Competition, ln Population density, FDI over GDP, Manufacturing employment share and $SO_2$ per capita. Columns 1 and 2 use stacked first differences for two time periods, 2010 to 2012 and 2012 to 2014. Columns 3 and 4 use first differences for the four-year period 2010-14. All individual and macroeconomic controls are included in first-differences.

regardless of income or openness. Column 1 drops the observations from the coastal provinces. The coastline of China is the hotbed of Chinese exports: thanks to its proximity to Hong Kong and Taiwan, a number of coastal cities have emerged as the major export-processing bases for foreign investors and are the largest exporting locations. They are also the richest areas of China. One the contrary, the West of the country is landlocked and mountainous, and is not conducive to international trade. Column 2 excludes the cities located in the West of China. The results continue to hold when these two types of cities are excluded.

**Table 7 – Life satisfaction and export opportunities: sample checks**

| Dependent variable | Life satisfaction | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample | coastal locations | Excluding Western locations | Top-5 exporters | Excluding Top 25% GDP/cap | Excluding Low. 25% GDP/cap | Excluding Top 25% Exp/GDP | Excluding Low. 25% Exp/GDP |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| ln $ExOp_{ct}$ | 0.066$^{b}$ | 0.111$^{a}$ | 0.059$^{c}$ | 0.081$^{a}$ | 0.088$^{b}$ | 0.080$^{a}$ | 0.101$^{b}$ |
| | (0.030) | (0.035) | (0.031) | (0.030) | (0.040) | (0.030) | (0.039) |
| | Time-varying individual and macroeconomic controls<br>Individual and province-year fixed effects | | | | | | |
| $R^2$ | 0.586 | 0.606 | 0.595 | 0.601 | 0.609 | 0.596 | 0.606 |
| No. of pref. | 63 | 97 | 89 | 87 | 87 | 88 | 88 |
| Observations | 33442 | 51490 | 47522 | 44795 | 46979 | 46552 | 48100 |

Heteroskedasticity-robust standard errors clustered at the prefecture-year level appear in parentheses. $^{a}$, $^{b}$ and $^{c}$ indicate significance at the 1%, 5% and 10% confidence levels respectively. The individual control variables included are ln family income per capita, relative income score, having a salaried job, self-employed with non-agricultural business, working in own agriculture family business, age, age-squared, working-age dummy, health score, urban dummy, agriculture hukou dummy, rural-urban migrant dummy, in couple dummy, number of children and Communist Party membership. The macroeconomic controls are (all at the prefecture level) ln GDP per capita, ln value added in primary industry and ln value added in secondary industry, ln Import Competition, ln Population density, FDI over GDP, Manufacturing employment share and $SO_2$ per capita.

Column 3 removes the Top-5 provinces in terms of exports: the positive coefficient on foreign export opportunities remains, which is reassuring in that our well-being enhancing effects of greater access to export markets are not limited to the most trade-oriented and richest locations.

To further check that our results do not just reflect the situation of privileged localities in terms of openness we exclude the prefectures with the highest and lowest exports respectively in Columns 4 and 5. These are defined as those with the export to GDP ratio in the top quartile or bottom quartile of the 2010 sample prefecture distribution. In Columns 6 and 7 of Table 7 we respectively exclude the high- and low-income locations based on whether their GDP per capita is in the top or bottom quartile of the 2010 distribution. The positive well-being repercussions from enhanced export opportunities are found for all of these location sub-samples, so that they do not only reflect the economic conditions or policy specificities which made some parts of China more or less likely to transform their foreign export opportunities into better living conditions.

## 6. Disentangling the potential channels

Our results so far suggest that greater export opportunities improve local life satisfaction, even taking into account any effect on personal income and observable individual and family characteristics. In what follows we ask whether this quality effect reflects an improvement of a global nature, or whether it is rather connected to economic activity.

### 6.1. Job satisfaction

A first approach to see whether our results above correspond to a general rise in satisfaction across all domains is to exploit the information we have on satisfaction in work- versus family-related domains. Table 8 reproduces our baseline results, replacing overall life satisfaction by family and job satisfaction respectively. These variables are unfortunately only available for a subset of our baseline sample and are only simultaneously observed in 2014, which prevents us from combining them in one sole regression. The CFPS survey includes a family-life satisfaction question (on a 1-5 scale) in 2012 and 2014. Family satisfaction is high and rising over the two-year period, with the average score increasing from 3.47 to 3.91. In 2014, two-thirds of respondents reported high or very high satisfaction with their family situation (scores of 4 and 5). In 2010 and 2014 the CFPS questionnaire included a question on job satisfaction (*"In general, how satisfied are you with your job?"*), answered on a scale of 1 to 5, with 1 being very dissatisfied and 5 very satisfied. Average job satisfaction rose from 3.27 in 2010 to 3.51 in 2014. Under 10% of respondents declared being dissatisfied or very dissatisfied with their current job. A large share (43.8%) are neither satisfied nor dissatisfied, while 34% report being satisfied and 12% very satisfied. The correlation between family and life satisfaction in our sample is high, at 0.77, and much higher than that between either of these indicators and job satisfaction (0.22 and 0.27 respectively).

The first three columns of Table 8 look at family satisfaction. In Column 1 the dependent variable is family satisfaction, while in Column 2 it is a dummy for high satisfaction (a score of 4 or 5) and in Column 3 it is a dummy for dissatisfaction (a score of 1 or 2). The last three columns of Table 8 consider job satisfaction, with the 1-5 score as the dependent variable in Column 3 and a dummy for high job satisfaction (a score of at least equal to 4) in Column 4 and a dummy for high job dissatisfaction in column 6 (a score below 3). For family satisfaction we find a positive coefficient on export opportunities, which is only significant in the first column. The point estimates are much lower than those for job satisfaction. This is consistent with family satisfaction largely reflecting personal elements, such as the temperament of family members and how well they get on. Even if better local export opportunities likely influence them, this will be to a lesser extent than the more direct repercussions on the material and market-related domains of life satisfaction, such as satisfaction with living conditions, work and prospects.

The results in Columns 4 and 6 are based on a much smaller sample (due to many missing observations in 2010) but nevertheless show that job satisfaction rises significantly as local export performance improves. This does not seem consistent with the image of "miserable" working conditions in the factories making goods destined for export, and especially with the surge in industrial disputes and strikes recorded in recent years, particularly in the

**Table 8 – Export opportunities and satisfaction with family and job**

| Dependent variable | Individual life satisfaction score | | | | | |
|---|---|---|---|---|---|---|
| Indicator | Family satisfaction | | | Job satisfaction | | |
| | Score 1-5 | Dummy high satisfaction $\geq 4$ | Dummy low satisfaction $\leq 2$ | Score 1-5 | Dummy high satisfaction $\geq 4$ | Dummy low satisfaction $\leq 2$ |
| | 2012 & 2014 | | | 2010 & 2014 | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ln $ExOp_{ct}$ | 0.071[b] | 0.015 | -0.011 | 0.165[b] | 0.075 | -0.064[b] |
| | (0.034) | (0.017) | (0.010) | (0.069) | (0.047) | (0.030) |
| | Time-varying individual and macroeconomic controls Individual and province-year FE | | | | | |
| No. of prefectures | 115 | 115 | 115 | 115 | 115 | 115 |
| $R^2$ | 0.682 | 0.644 | 0.618 | 0.630 | 0.621 | 0.564 |
| Observations | 35808 | 35808 | 35808 | 8534 | 8534 | 8534 |

Heteroskedasticity-robust standard errors clustered at the prefecture-year level appear in parentheses. [a], [b] and [c] indicate significance at the 1%, 5% and 10% confidence levels respectively. The individual control variables included are ln family income per capita, relative income score, having a salaried job, self-employed with non-agricultural business, working in own agriculture family business, age, age-squared, working-age dummy, health score, urban dummy, agriculture hukou dummy, rural-urban migrant dummy, in couple dummy, number of children and Communist Party membership. The macroeconomic controls are (all at the prefecture level) ln GDP per capita, ln value added in primary industry and ln value added in secondary industry, ln Import Competition, ln Population density, FDI over GDP, Manufacturing employment share and $SO_2$ per capita.

regions that constitute the heart of the Chinese export powerhouse (Ren et al., 2016). However, it is consistent with slowdowns and business closures being the main causes of worker protests in China (China Labour Bulletin, 2014): rising export opportunities appears to help guarantee job retention and good working conditions.

The results in Table 8 suggest that the positive association between life satisfaction and export opportunities does not not only reflect a general feeling of happiness over all domains of life, including the private ones. Our results instead suggest an improvement in the professional sphere, which is a likely mechanism for the transmission of the monetary and non-monetary benefits from increased export opportunities.

We further investigate the role of labor-market participation as a channel for well-being. Our prior is that if the life-satisfaction gains correspond to changes in working conditions, they should be especially relevant for the active, and especially those in export-oriented economic sectors.

As we do not have direct information on participation in export activities we consider proxy variables. Table 9 considers separate well-being effects of exports according to urban or rural location. China's exports primarily come from urban areas, where the special economic zones devoted to export (processing) activities are clustered (Wang, 2013). Moreover rural dwellers are more likely to work in Agriculture, while Chinese exports are almost exclusively made up of Manufactured goods.[33] In the first three columns of Table 9 we estimate Equation 4 for urban residents, while the last three columns focus on respondents in rural areas. While columns 1 and 4 cover all respondents in the designated

[33] Agricultural products accounted for only 3% of China's exports in 2014.

location, the following two columns differentiate according to whether the individuals are active or not. Consistent with urban areas exporting more, better local export performance benefits urban residents more than rural residents. This heterogeneity in the perceived gains is reassuring in that our results do indeed relate to export demand changes and not to some change in the local political or economic climate.

Columns 2 and 3 focus on urban dwellers, with Column 2 referring to those who have a job, while Column 3 considers those who do not. The coefficient on foreign export opportunities is positive and significant in both sub-samples, suggesting that the repercussions from greater export demand are felt by both workers and those who do not work. The point estimates are slightly larger for the former, although the difference is not significant. This is nevertheless consistent with the labor market acting as a transmission channel for the benefits of greater export opportunities. The results in Columns 5 and 6 confirm this prior, as the effects are significant for working rural dwellers but insignificant for non-working rural residents.

**Table 9 – Life satisfaction and export opportunities: urban versus rural**

| Dependent variable | Life satisfaction of individuals | | | | | |
|---|---|---|---|---|---|---|
| Sample | Urban | | | Rural | | |
| | All | Has Job | No Job | All | Has Job | No Job |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ln $ExOp_{ct}$ | 0.102[a] | 0.138[a] | 0.118[c] | 0.069[c] | 0.077[b] | 0.102 |
| | (0.036) | (0.045) | (0.061) | (0.036) | (0.039) | (0.097) |
| | Time-varying individual and macroeconomic controls<br>Individual and province-year FE | | | | | |
| No. of prefectures | 108 | 108 | 107 | 99 | 98 | 96 |
| $R^2$ | 0.617 | 0.645 | 0.631 | 0.593 | 0.619 | 0.626 |
| Observations | 28771 | 15006 | 8337 | 34123 | 22654 | 4626 |

Heteroskedasticity-robust standard errors clustered at the prefecture-year level appear in parentheses. [a], [b] and [c] indicate significance at the 1%, 5% and 10% confidence levels respectively. The individual control variables included are ln family income per capita, relative income score, age, age-squared, working-age dummy, health score, urban dummy, agriculture hukou dummy, rural-urban migrant dummy, in couple dummy, number of children and Communist Party membership. Columns 1,2,4 and 5 also include having a salaried job, self-employed with non-agricultural business, and working in own agriculture family business. The macroeconomic controls are (all at the prefecture level) ln GDP per capita, ln value added in primary industry and ln value added in secondary industry, ln Import Competition, ln Population density, FDI over GDP, Manufacturing employment share and $SO_2$ per capita.

The finding of a positive well-being effect for urban residents irrespective of their labor-force status suggests that the benefits do not only accrue to those who are the most directly exposed to export opportunities via their work. The gains are thus diffused between individuals and ultimately apply to everyone. The family is a privileged arena for this sharing. Table 10 considers the possibility that the welfare gains from export opportunities of exposed family members via their work affect the life satisfaction of other family members. Our prior is that the benefits passing via the labor market subsequently spill over to other family members, and notably those who do not work. As we control for per capita household income in our regressions, our results evaluate the intra-household spillovers of the perceived non-monetary benefits from greater export opportunities.

Table 10 then asks whether the well-being gains from exports reflect proximity to other

working individuals. The odd columns refer only to the non-employed, while the even columns refer to individuals who are active. Columns 1 and 2 interact export opportunities with a dummy for households where at least one other family member works in that year. Columns 3 and 4 include an interaction with the share of family members that declare to have a job. These interactions are intended to capture the extent to which the non-monetary well-being gains from enhanced export opportunities for non-working respondents depend on the labor-market participation of the rest of the household. Our results are consistent with spillovers that benefit those without a job. Both interactions attract a positive significant estimated coefficient for this group, suggesting that the well-being gains of economically-inactive respondents come from them sharing their lives with individuals who may be exposed to greater export opportunities at work. There thus seems to be a diffusion of the non-monetary gains of working family members throughout the household. In contrast, these additional interaction terms attract a very small and insignificant coefficient for individuals who are working themselves. We conclude that the benefits from greater export opportunities transit via the labor market and are found not only directly for workers but also indirectly for other family members.

**Table 10 – Evidence of spillovers within the household**

| Dependent variable | Life satisfaction of individuals | | | |
|---|---|---|---|---|
| Sample | No job | Has a job | No job | Has a job |
| | (1) | (2) | (3) | (4) |
| ln $ExOp_{ct}$ | 0.102$^c$ | 0.082$^a$ | 0.104$^c$ | 0.081$^a$ |
| | (0.055) | (0.031) | (0.054) | (0.030) |
| Ln $ExOp_{ct}$ | 0.024$^c$ | 0.003 | | |
| $\times$ Other working family member$^i_t$ | (0.013) | (0.008) | | |
| Other working family member$^i_t$ | -0.633$^c$ | -0.018 | | |
| | (0.333) | (0.204) | | |
| Ln $ExOp_{ct}$ | | | 0.048$^b$ | 0.009 |
| $\times$ Share of other family members who have a job$^i_t$ | | | (0.022) | (0.014) |
| Share of other family members who have a job$^i_t$ | | | -1.231$^b$ | -0.173 |
| | | | (0.584) | (0.347) |
| | Time-varying individual and macroeconomic controls Individual and province-year fixed effects | | | |
| No. of prefectures | 116 | 116 | 116 | 116 |
| $R^2$ | 0.626 | 0.625 | 0.626 | 0.625 |
| Observations | 13179 | 38412 | 13179 | 38412 |

Heteroskedasticity-robust standard errors clustered at the prefecture-year level appear in parentheses. $^a$, $^b$ and $^c$ indicate significance at the 1%, 5% and 10% confidence levels respectively. The individual control variables included are ln family income per capita, relative income score, age, age-squared, working-age dummy, health score, urban dummy, agriculture hukou dummy, rural-urban migrant dummy, in couple dummy, number of children and Communist Party membership. Columns 2 and 4 also include having a salaried job, self-employed with non-agricultural business, and working in own agriculture family business. The macroeconomic controls are (all at the prefecture level) ln GDP per capita, ln value added in primary industry and ln value added in secondary industry, ln Import Competition, ln Population density, FDI over GDP, Manufacturing employment share and $SO_2$ per capita.

Our results so far thus tell a story in which greater export opportunities improve overall satisfaction, particularly through working conditions and career prospects. This improvement is mostly felt by active urban dwellers, as they are more likely exposed to export markets, but is also diffused throughout the household.

### 6.2. Health

The results above are positive, in that China's greater export orientation has not come at the expense of the local population's well-being. On the contrary, better export opportunities improve perceived work conditions and raise the life satisfaction of the exposed individuals as well as their families. It is nevertheless possible that these positive developments are accompanied by some less-beneficial changes. The competitive pressure and permanent adjustments brought about by the race for international markets can have deleterious effects on workers' physical and mental health (Hummels et al., 2016).

Table 11 investigates the relationship between exports and self-assessed health. The first three columns use the health score (measured as 1=Poor, 2=Fair, 3=Good, 4=Very Good and 5=Excellent) and the latter columns a dummy for bad health (a score of 1 or 2 in Columns 4 to 6, and a score of 1 in Columns 7 to 9).[34] While Columns 1, 4 and 6 run Equation 4 with health as the dependent variable on our baseline sample, the following columns separate the economically active from the others. By doing so we see if any adverse health effects transit via the labor market and therefore only appear for workers. The results in Columns 4 to 6 suggest that greater export opportunities are associated with worse health. This is consistent with more exports producing increased pressure on employees, possibly leading to work-related injury and illness. The estimated effect is however not large, and not robust as it becomes insignificant when we use a stricter threshold to define bad health. Nevertheless, the possibility of a negative health effect of greater export opportunities for Chinese workers is a potential harmful consequence of China's export growth.

**Table 11 – Export opportunities and health**

| Dep. var. | Individual health score | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Indicator | Score 1-5 | | | Low health dummy (score< 3) | | | Low health dummy (score< 2) | | |
| Sample | All | Job | No job | All | Job | No job | All | Job | No job |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| ln $ExOp_{ct}$ | -0.037 | -0.041 | -0.037 | 0.023$^{b}$ | 0.026$^{b}$ | 0.036$^{c}$ | 0.009 | 0.010 | -0.003 |
| | (0.027) | (0.034) | (0.046) | (0.010) | (0.012) | (0.021) | (0.009) | (0.010) | (0.020) |
| | Time-varying individual and macroeconomic controls<br>Individual and province-year FE | | | | | | | | |
| No. of pref. | 116 | 116 | 116 | 116 | 116 | 116 | 116 | 116 | 116 |
| $R^2$ | 0.746 | 0.748 | 0.783 | 0.623 | 0.638 | 0.660 | 0.597 | 0.627 | 0.640 |
| Observations | 64008 | 38412 | 13179 | 64008 | 38412 | 13179 | 64008 | 38412 | 13179 |

Heteroskedasticity-robust standard errors clustered at the prefecture-year level appear in parentheses. $^{a}$, $^{b}$ and $^{c}$ indicate significance at the 1%, 5% and 10% confidence levels respectively. The individual control variables included are ln family income per capita, relative income score, age, age-squared, working-age dummy, urban dummy, agriculture hukou dummy, rural-urban migrant dummy, in couple dummy, number of children and Communist Party membership. Columns 1, 2, 4, 5, 7 and 8 also include having a salaried job, self-employed with non-agricultural business, and working in own agriculture family business. The macroeconomic controls are (all at the prefecture level) ln GDP per capita, ln value added in primary industry and ln value added in secondary industry, ln Import Competition, ln Population density, FDI over GDP, Manufacturing employment share and $SO_2$ per capita.

Last, Table 12 focuses on mental distress, which could rise following rapid export growth.

[34] Scores of 1 and 2 are respectively reported by 12.9% and 14.9% of respondents.

Depression is measured using a question (present in 2010 and 2014) about the frequency with which respondents felt depressed in the previous month: the answers are "Never", "Once a month", "2-3 times a month", "Often" and "Almost every day". We code these from 1 to 5 as a measures of depression intensity. Half of our sample (48.6%) report no sign of depression (responding "Never") and 37.8% that they were only depressed once. The remaining 14% felt depressed at least 2 or 3 times a month: this is the group we call the depressed. Columns 1 to 3 analyze the score itself, while Columns 4 to 6 consider the dummy for being depressed. In Columns 2 and 3 and columns 5 and 6 we see whether the results differ by employment status. We find no evidence of detrimental mental-health effects. If anything, the results in Column 4 suggest that greater export activity reduces the probability of severe depression and may improve the mental health of the inactive. This result adds to those in Colantone et al. (2015) on the impact of import competition on mental health in the UK. Overall our results are consistent with a scenario where greater demand for local products leads to increased work speed, producing worse physical health, but no effect on mental health.

**Table 12 – Export opportunities and depression**

| Dependent variable | Individual depression score (2010 & 2014) | | | | | |
|---|---|---|---|---|---|---|
| Indicator | Score 1-5 | | | Dummy Never depressed | | |
| Sample | All | Job | No job | All | Job | No job |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ln $ExOp_{ct}$ | -0.058 | -0.017 | -0.212 | 0.064$^{b}$ | 0.065 | 0.049 |
| | (0.052) | (0.055) | (0.130) | (0.028) | (0.041) | (0.058) |
| | Time-varying individual and macroeconomic controls<br>Individual and province-year FE | | | | | |
| No. of prefectures | 116 | 116 | 113 | 116 | 116 | 113 |
| $R^2$ | 0.612 | 0.612 | 0.627 | 0.610 | 0.615 | 0.605 |
| Observations | 33366 | 17458 | 5532 | 33366 | 17458 | 5532 |

Heteroskedasticity-robust standard errors clustered at the prefecture-year level appear in parentheses. $^{a}$, $^{b}$ and $^{c}$ indicate significance at the 1%, 5% and 10% confidence levels respectively. The individual control variables included are ln family income per capita, relative income score, age, age-squared, working-age dummy, health score, urban dummy, agriculture hukou dummy, rural-urban migrant dummy, in couple dummy, number of children and Communist Party membership. Columns 1, 2, 4 and 5 also include having a salaried job, self-employed with non-agricultural business, and working in own agriculture family business. The macroeconomic controls are (all at the prefecture level) ln GDP per capita, ln value added in primary industry and ln value added in secondary industry, ln Import Competition, ln Population density, FDI over GDP, Manufacturing employment share and $SO_2$ per capita.

## 7. Conclusion

Globalization, which has been one of the major economic phenomena of recent decades, seems to have reached a historic turning point. Multilateral trade negotiations have been stalled for years, major regional agreements are being contested, the European Union is struggling to redefine an ambitious integration project, diplomatic sanctions affecting trade and threats of trade wars are multiplying, and the political weight of nationalist and/or anti-globalization movements is on the rise in many countries. This undoubtedly reflects a certain ideological reversal, and in many countries the fear of globalization is gaining ground. For their part, a growing number of governments and political leaders seem increasingly doubtful that deeper international integration can bring gains for firms and workers exposed to import competition that outweigh the costs.

Recent academic research has actively contributed to these intellectual debates by intensifying the efforts made to better assess the gains from and costs of international trade. This has essentially proceeded along two complementary lines that make it possible to better understand changes in public opinion regarding globalization and inform public decisions over trade and accompanying social policies. The first approach aims to improve the understanding and assessment of (the long-term) welfare gains of trade openness (e.g. Costinot and Rodriguez-Clare, 2014). The second approach has focused on the (short-term) adjustment costs borne by firms and workers under pressure from global competition.

Our work forms part of this second strand, complementing the many contributions that, following Autor et al. (2013), assess the social cost for workers in developed countries of increased competition from Chinese exports. We contribute to the assessment of the short-term social impact of globalization by looking at the other side of the coin: the consequences of rising export opportunities on perceived well-being in China.

We here estimate the relationship between a locality's greater export demand and the life satisfaction of those who live there, using microeconomic data from the China Family Panel Studies in 2010, 2012 and 2014. We control for individual and family observable characteristics as well as individual fixed effects and province-year fixed effects, which are expected to explain a large part of life satisfaction. Even after controlling for all of these factors, including income and health, reported quality of life rises significantly as export opportunities grow. These well-being gains seem to be channelled by the labor market. They go beyond an improvement in local economic conditions and do not reflect a general improvement in satisfaction in all domains. Greater trade openness has not then reduced well-being in China but, on the contrary, has led to higher overall and job satisfaction of those concerned, as well the life satisfaction of others in the household.

Overall our analysis produced two main conclusions. First, we provide an optimistic note to the ongoing debate over the social consequences of globalization. The rise of China as the factory of the world is often portrayed as a negative-sum game for workers around the world: while manufacturing workers in developed countries lose their jobs and social status, Chinese workers are exploited in factories with degrading working conditions. There is undoubtedly some truth in this story, as working conditions can still be harsh for many industrial workers in China. Nevertheless, we find that export expansion contributes directly, and fairly significantly, to the well-being of the Chinese. It is of course impossible for us to say to what extent this benefit outweighs the social costs in the North, but it is nonetheless important to keep this fact at the heart of debates over globalization and trade negotiations.

Second, we provide food for thought on how individuals translate better economic conditions into subjective well-being. A great deal of empirical work has shown that higher income has only a limited effect on well-being: our estimates confirm this conclusion. But we also show that most of the well-being benefits perceived by the Chinese from exports do not transit via income. We clearly show that the well-being effects pass through the labor market in a certain way, and even after controlling for income and employment status the effect remains significant. It seems likely that both working conditions and greater confidence regarding the future, for oneself and others in the family, are important elements

of well-being. As such, although the impact of rising incomes on subjective well-being is limited, it does not follow that better economic conditions in general have little influence in this respect.

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## Appendix A

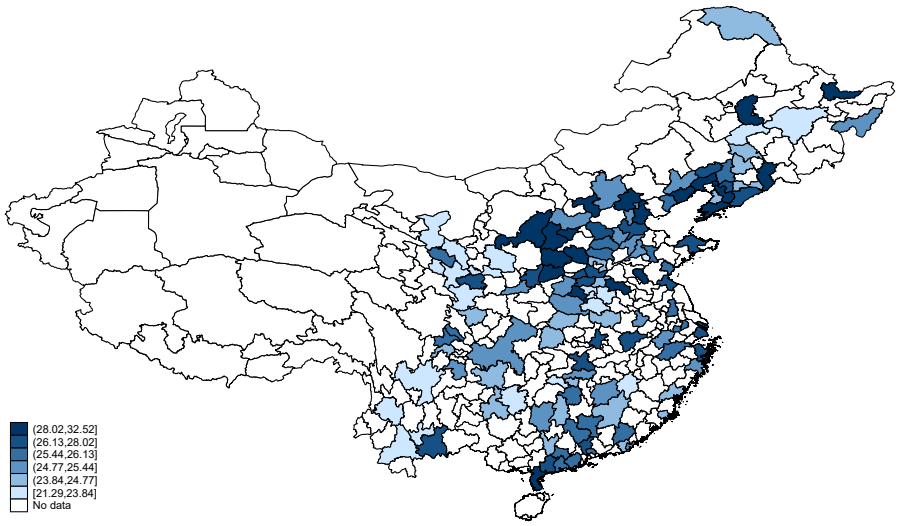


**Figure A-1 – Export opportunities in 2012 by 4-digit locations (in logs)**

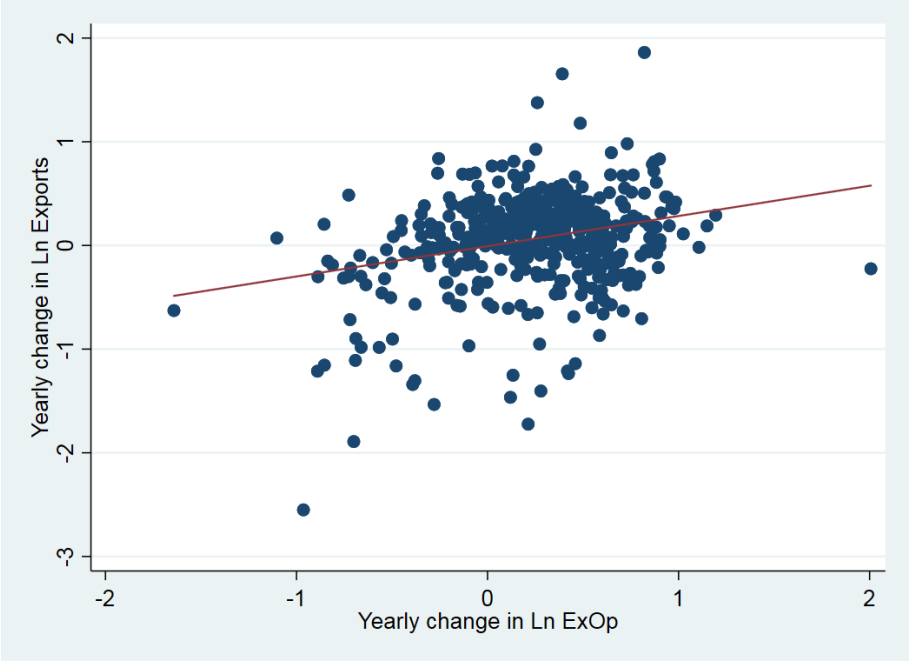


**Figure A-2 – The correlation of the yearly changes in exports and export opportunities (2009-2012) by 4-digit locations. The slope is 0.29 with a standard error of 0.061 (t-stat=4.81), N = 500. The sample is the 125 CFPS prefectures, with four annual observations per prefecture.**

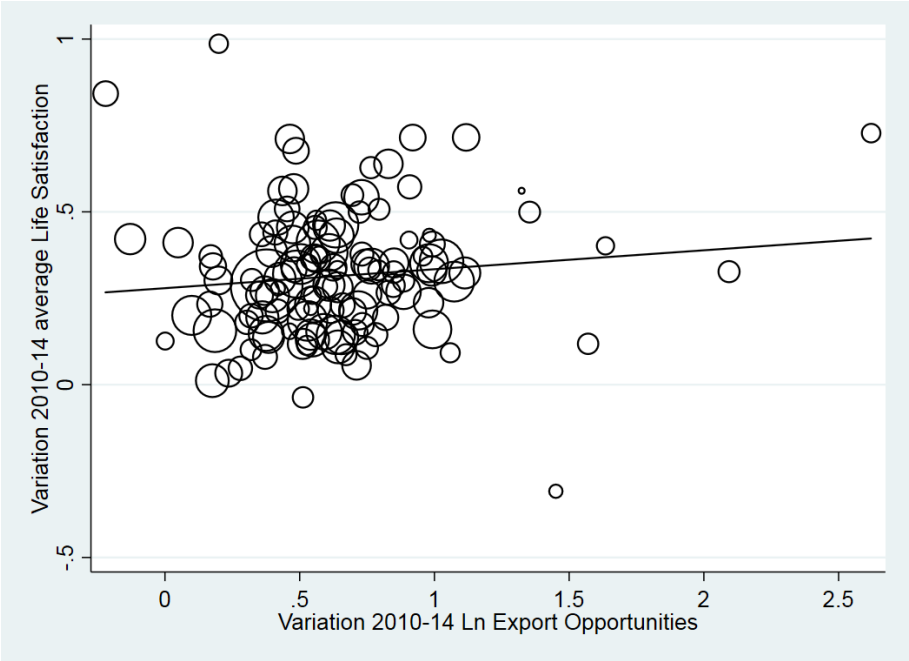


**Figure A-3 – The correlation of the changes in average life satisfaction and export opportunities (2010-2014) by 4-digit locations. The circle size is proportional to the local population. The slope is 0.055 with a standard error of 0.051, N=125. The sample is the 125 CFPS prefectures.**

**Table A-1 – Summary statistics**

| Variable | Median | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Life satisfaction | 4 | 3.5 | 1.1 | 1.0 | 5.0 |
| Very satisfied with life (Life satisfaction$\geqslant$ 4) | 1 | 0.5 | 0.5 | 0 | 1 |
| Ln ExOp | 25.3 | 25.6 | 2.6 | 19.3 | 33.2 |
| Household income per capita | 7,925 | 11,746 | 17,797 | 1 | 1,518,023 |
| Individual income | 13,000 | 18,927 | 27,344 | 1 | 1,800,000 |
| Perceived relative income status | 2 | 2.3 | 1 | 1 | 5 |
| Salaried employment | 0 | 0.3 | 0.4 | 0 | 1 |
| Self employment | 0 | 0.1 | 0.2 | - | 1 |
| Ag. work for family business | 0 | 0.3 | 0.5 | 0 | 1 |
| Health status (1 to 5 scale) | 3 | 3.3 | 1.3 | 1 | 5 |
| Age | 47 | 47.7 | 14.7 | 16 | 95 |
| Working age dummy (age$\leq$65) | 1 | 0.8 | 0.4 | 0 | 1 |
| Non-agricultural Hukou | 0 | 0.3 | 0.5 | 0 | 1 |
| Urban | 0 | 0.4 | 0.5 | 0 | 1 |
| Rural-Urban migrant | 0 | 0.2 | 0.4 | 0 | 1 |
| In couple | 1 | 0.9 | 0.3 | 0 | 1 |
| Number of children | 2 | 1.9 | 1.2 | 0 | 10 |
| Communist Party member | 0 | 0.1 | 0.3 | 0 | 1 |
| Male | 1 | 0.50 | 0.50 | 0 | 1 |
| $\Delta$ Life satisfaction 2010-14 | 0 | 0.32 | 1.25 | -4 | 4 |
| $\Delta$ Very satisfied with life 2010-14 | 0 | 0.12 | 0.62 | -1 | 1 |
| $\Delta$ Ln ExOp 2010-14 | 0.56 | 0.65 | 0.42 | -0.71 | 6.98 |
| $\Delta$ Ln Family per capita income | 0.36 | 0.23 | 1.26 | -10.73 | 8.76 |
| $\Delta$ Ln Individual income | 0.62 | 0.72 | 1.21 | -8.10 | 11.53 |

These statistics refer to the sample of 64,008 observations used in the baseline regression (Column 4 in Table 2).

## Appendix B

Table B-1 summarizes a series of robustness tests to ensure that the coefficient on export opportunities is unchanged when we use different income measures. Compared to our baseline (Column 4 in Table 2), Column 1 does not include the perceived relative income score, while Column 2 includes perceived relative income but drops household income per capita. In Columns 3 to 7, we restrain our sample to the observations for which we have information on individual income, and use different combinations of our three variables that aim to capture individual earnings. The point estimates of the well-being gains from export opportunities are consistent across the specifications, suggesting that the variables we use in our baseline regression (perceived relative income score and household income per capita) do a good job in capturing the relevant information on individual earnings.

**Table B-1 – Life satisfaction and export opportunities: alternative measures of income**

| Dependent variable | Life satisfaction (2010, 2012 & 2014) | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Sample | A<br>with household income<br>column 4 Table 2 | | B<br>with individual income<br>column 6 Table 2 | | | |
| ln $ExOp_{ct}$ | 0.072$^{b}$ | 0.077$^{a}$ | 0.092$^{a}$ | 0.095$^{a}$ | 0.097$^{a}$ | 0.097$^{a}$ |
| | (0.030) | (0.028) | (0.034) | (0.032) | (0.032) | (0.032) |
| Ln family income (per capita)$^{i}_{t}$ | 0.027$^{a}$ | | | | 0.054$^{a}$ | 0.053$^{a}$ |
| | (0.008) | | | | (0.013) | (0.013) |
| Perceived relative income score$^{i}_{t}$ | | 0.181$^{a}$ | | 0.203$^{a}$ | 0.202$^{a}$ | 0.201$^{a}$ |
| | | (0.007) | | (0.011) | (0.011) | (0.011) |
| Ln personal income$^{i}_{t}$ | | | 0.033$^{a}$ | 0.013 | | 0.002 |
| | | | (0.009) | (0.009) | | (0.009) |
| | Time-varying individual and macroeconomic controls<br>Individual and province-year FE | | | | | |
| $R^2$ | 0.589 | 0.601 | 0.628 | 0.640 | 0.641 | 0.641 |
| No. of prefectures | 116 | 116 | 116 | 116 | 116 | 116 |
| Observations | 64008 | 64008 | 23464 | 23464 | 23464 | 23464 |

Heteroskedasticity-robust standard errors clustered at the prefecture-year level appear in parentheses. $^{a}$, $^{b}$ and $^{c}$ indicate significance at the 1%, 5% and 10% confidence levels respectively. The individual control variables included are having a salaried job, self-employed with non-agricultural business, working in own agriculture family business, age, age-squared, working-age dummy, health score, urban dummy, agriculture hukou dummy, rural-urban migrant dummy, in couple dummy, number of children and Communist Party membership. The macroeconomic controls are (all at the prefecture level) ln GDP per capita, ln value added in primary industry and ln value added in secondary industry, ln Import Competition, ln Population density, FDI over GDP, Manufacturing employment share and $SO_2$ per capita.