International Trade and Labor Income Risk in the United States

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Abstract

This paper studies empirically the links between international trade and labor income risk faced by workers in the United States. We use longitudinal data on workers to estimate time-varying individual income risk at the industry level. We then combine our estimates of persistent labor income risk with measures of exposure to international trade to analyze the relationship between trade and labor income risk. Importantly, by contrasting estimates from various sub-samples of workers, such as those who switched to a different industry (or sector) with those who remained in the same industry throughout the sample, we study the relative importance of the different channels through which international trade affects individual income risk. Finally, we use these estimates to conduct a welfare analysis evaluating the benefits or costs of trade through the income risk channel. We find increased import penetration to have a statistically and economically significant effect on labor income risk in the US. Under standard parameter values for the inter-temporal discount rate and the rate of risk aversion, this increase in risk is (certainty) equivalent to a reduction in lifetime consumption of about five percent.

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I. Introduction

A vast literature has examined the effects that globalization may have on workers in the domestic economy. The focus has largely been on the important question of how trade might affect wages and, specifically, of how workers in different human capital or occupational categories may be differently affected (on average) by an economy's openness to international trade.[1] This impressive literature has uncovered many interesting findings regarding the "mean" effects of globalization on labor markets. However, for most part, this literature has not addressed a broadly expressed public concern regarding another possible effect of globalization: that openness to international trade may expose workers to riskier economic environments causing greater volatility (variance) in their incomes.[2]

How might trade openness affect labor income volatility? In theory, there are various channels through which exposure to international trade could affect labor income risk. For example, increased trade is likely to induce a reallocation of factors across firms and sectors. To the extent that ex-ante identical workers experience different outcomes after their reallocation (as in Fernandez and Rodrik (1993)), openness will raise labor income risk. Another link between trade and income volatility has been argued by Rodrik (1997). Here, increased foreign competition, which increases the elasticities of final good demand, will also lead to an increase in derived factor demand elasticities. A higher elasticity of labor demand implies that shocks to labor demand will lead to higher volatility in wages and employment and hence increased risk. On the other hand, it has also been suggested that the world economy, by aggregating shocks across countries, may be less volatile than the economy of any single country -- opening up the possibility that greater openness may reduce the variance in individual incomes. Thus, theoretically, the openness-volatility relationship is ambiguous, that is, the theoretical literature does not

[1] Classic papers in this literature include Lawrence and Slaughter (1993), Leamer (1996) and Feenstra and Hanson (1999). Feenstra and Hanson (2002) and Goldberg and Pavcnik (2006) provide excellent survey treatments. Recent analyses exploring labor market effects of globalization in the context of the Melitz (2003) model of heterogeneous firms include Davis and Harrigan (2007), Amiti and Davis (2008) and Helpman, Itskhoki and Redding (2008).
[2] Exceptions include Krebs, Krishna, and Maloney (2005), which studies Mexico, DiGiovanni and Levchenko (2007) which provides interesting evidence regarding the links between trade and sectoral output volatility and Mclaren and Newman (2002) which studies how globalization may weaken domestic institutions for risk-sharing.

offer a strong prior on the sign or magnitude of this relationship. The question is an empirical one.

This paper undertakes a detailed empirical analysis of the association between trade and labor income risk in the United States. We use longitudinal data on workers in the United States to estimate the income risk they face and to study the role of trade in explaining the variation in this risk across workers employed in different industries.[3] To estimate labor income risk (defined as the variance of unpredictable changes in earnings), we employ specifications of the labor income process each of which are sufficiently elaborate to distinguish between transitory and persistent shocks to income. This distinction is important since workers can effectively "self-insure" against transitory shocks through borrowing or own savings, and the welfare effects of such shocks are quite small (Heaton and Lucas (1996), Levine and Zame (2002)). In contrast, highly persistent or permanent income shocks have a substantial effect on the present value of future earnings and therefore lead to significant changes in consumption. Thus, from a welfare point of view, persistent income shocks matter the most and therefore it is these shocks that we focus on.

In our analysis, we combine our industry-level time-varying estimates of the persistent component of labor income risk with measures of exposure to international trade to estimate the relationship between labor income risk and trade. Importantly, we then repeat this analysis for different sub-samples of workers, such as those who switched to a different industry or sector or those who remained in the same industry throughout the sample. This allows us to identify these separate components of risk faced by individuals and to evaluate the relative importance of the different channels through which international trade can affect individual income risk. One strength of our methodological approach is that we are able to use these estimates to conduct a welfare analysis to evaluate benefits or costs of trade through the income risk channel.

Our empirical results for the United States can be summarized as follows. First, we find those workers who switched industries (moving to a different manufacturing

[3]We use the Survey of Income and Program Participation (SIPP) in our analysis. SIPP contains longitudinal panels on individuals (and households) with each panel ranging roughly three years in duration. We use data from three SIPP panels—the 1993, 1996 and 2001 panels—in our study.

sector or to a non manufacturing sector) experience higher income risk compared to those who stayed in the same manufacturing industry throughout the sample. Estimated risk for those who switched to the non-manufacturing sector is higher than those who switched within manufacturing. Second, we find that within industry changes in income risk are strongly related to changes in import penetration over the corresponding time periods. Specifically, our estimates suggest that an increase in import penetration of ten percent is associated with an increase in the standard deviation of persistent income shocks of about fifteen to twenty percent. Under standard parameter values for the inter-temporal discount rate and the rate of risk aversion, this would suggest that this increase in persistent income risk is (certainty) equivalent to a reduction by five to ten percent of lifetime consumption.

It is worth pointing out that our analysis focus exclusively on the link between trade and individual income risk. Hence they should be taken together with the findings of a large literature on international trade exploring the many ways in which trade may affect the economy positively, through improved resource allocation or by possibly raising growth rates. These effects, as studied by a large literature in international trade, are clearly important. Therefore, the results presented here should not be interpreted as trade resulting in welfare reduction, but instead, as strong evidence that the costs of increased labor income risk ought to be taken into account when evaluating the total costs and benefits of trade and trade policy reform.

II. Income Risk

The first stage of our analysis concerns the estimation of individual income risk. Our estimation strategy follows earlier approaches in the literature estimating US labor income risk (Carroll and Samwick (1997), Gourinchas and Parker (2002), Meghir and Pistaferri (2004)) with some important differences that we discuss in detail below. As in these papers, we define income risk as the variance of (unpredictable) changes in individual income, and carefully distinguish between transitory and persistent income shocks. As we have already discussed, from a welfare point of view, this separation is essential for two reasons. First, consumption smoothing through borrowing or own savings works well for transitory income shocks (Aiyagari (1994), Heaton and Lucas

(1996), Levine and Zame (2002)), but not when income shocks are highly persistent or permanent (Constantinides and Duffie (1996) and Krebs (2003 and 2004). Thus, highly persistent income shocks have a large effect on consumption volatility and welfare, whereas the effect of transitory shocks is relatively small. Second, the transitory term in our econometric specification of the income process will absorb the measurement error in individual income. For these reasons, we will focus on persistent shocks and their relation to trade policy.

II.1. Data

In this paper we use longitudinal data on individuals from the 1993-1995, 1996-1999 and 2001-2003 panels of the Survey of Income and Program Participation (SIPP). Each panel of the SIPP is designed to be a nationally representative sample of the US population and surveys thousands of workers. The interviews are conducted at four-month intervals over a period of three years for the 1993 panel, four years for the 1996 panel and three years again for the 2001 panel.[4] At each interview, data on earnings and labor force activity are collected for each of the preceding four months.

SIPP has several advantages over other commonly used individual-level datasets in that it includes monthly information on earnings and employment over a long panel period for a large sample. Although the Current Population Survey (CPS) provides a larger sample, individuals are only sampled for eight months over a two-year period in comparison to 33 months in the SIPP. While the Panel Study of Income Dynamics (PSID) provides a much longer longitudinal panel, it has a significantly smaller sample size compared to the SIPP and therefore does support the estimation of risk at the industry level.

In our analysis, we restrict the SIPP sample to respondents of age 16 to 65 who were not enrolled in school during a given month. Following previous literature, we exclude all observations for individuals whose earnings in any month were less than 10% or higher than 90% of the individual's average monthly earnings.[5] Table I

[4] We limit our main analysis to data from the first three years of the 1996 panel to ensure comparability of our risk estimates with the other two panels.
[5] This results in the omission of approximately 15% of the respondents of each panel from our sample.

presents a summary description of the workers surveyed in each panel. The summary statistics calculated for the first month of each panel are reported separately for the whole sample and for the manufacturing sector only. Workers earnings represent amounts actually received in wages and salary and/or from self-employment, before deductions for income and payroll taxes, union dues, Medicare premiums, etc. We supplement the SIPP data with data on international trade from the US Department of Commerce and the Federal Reserve Bank of New York.

II.2. Specification

Our survey data provide us with earnings (wage rate times number of hours worked) of individuals. As in previous empirical work, we assume that the log of labor income of individual i employed in industry j in time period (month) t, $log\ y_{ijt}$, is given by:

$$log\ y_{ijt} = \alpha_{jt} + \beta_t \cdot x_{ijt} + u_{ijt}\ . \qquad (1)$$

In (1) α_{jt} and β_t denote time-varying coefficients, x_{ijt} is a vector of observable characteristics (such as age, education, marital status, occupation, race, gender and industry), and u_{it} is the stochastic component of earnings. The stochastic component u_{ijt} represents individual income changes that are *not* due to changes in the return to observable worker characteristics. For example, income changes that are caused by an increase in the skill (education) premium are not contained in u_{ijt}. In this sense, u_{ijt} measures the unpredictable part of changes in individual income. Notice that we allow the fixed effects α_{jt} to vary across sectors, but that the coefficient β_t is restricted to be equal across sectors. The latter assumption is made in order to ensure that the number of observations is large compared to the number of parameters to be estimated. In addition to specification (1), we also conduct our analysis using alternate specifications. Specifically, while (1) takes out any changes to income that may have occurred due to changes in returns to observable characteristics, another possibility is to treat these changes as unpredictable by requiring the coefficients β to be time-invariant.[6] This does not, however, affect our results in any way.

We assume that the stochastic term is the sum of two (unobserved) components, a permanent component ω_{ijt} and a transitory component η_{ijt}:

$$u_{ijt} = \omega_{ijt} + \eta_{ijt} \,. \qquad (2)$$

Permanent shocks to income are fully persistent in the sense that the permanent component follows a random walk:

$$\omega_{ij,t+1} = \omega_{ijt} + \varepsilon_{ij,t+1} \,, \qquad (3)$$

where the innovation terms, $\{\varepsilon_{ijt}\}$, are independently distributed over time and identically distributed across individuals, $\varepsilon_{ijt} \sim N(0, \sigma^2_{\varepsilon js})$, where s denotes the SIPP panel (i.e., one of the 1993–1995, 1996–1998 or 2001-2003 panels). Transitory shocks have no persistence, that is, the random variables $\{\eta_{ijt}\}$ are independently distributed over time and identically distributed across individuals, $\eta_{ijt} \sim N(0, \sigma^2_{\eta\, js})$. Note that the parameters describing the magnitude of both transitory and persistent shocks are assumed to depend on the sector *j* and the SIPP panel *s*, but do not depend on *t*. That is to say, they are assumed to be constant within a SIPP panel, but allowed to vary across panels.

Our benchmark specification for the labor income process (Equations (1)–(3)) is in accordance with other empirical work on US labor income risk.[7] In addition, we examine alternate specifications that allow for shocks that have duration greater than one or multiple time periods but that are not permanent. That is to say, we admit into the specification some moving average terms:

$$u_{ijt} = \omega_{ijt} + \sum_{k=0}^{K} \eta_{ijt-k} \,, \qquad (2')$$

with K indicating the number of moving average terms. As will be seen below, in addition to the benchmark specification where transitory shocks are purely transitory

[6] In practice, however, estimates of the parameters representing income risk do not seem to depend very much on whether the changes in returns to observable characteristics are accounted for by allowing β to be time variant, or not, in estimating (1).

[7] For example, Carroll and Samwick (1997) and Gourinchas and Parker (2002) use exactly our specification. Hubbard, Skinner, and Zeldes (1994) and Storesletten, Telmer, and Yaron (2004) assume that the permanent component is an AR(1) process, but estimate an autocorrelation coefficient close to one (the random walk case).

(K=0), we will allow for transitory shocks that last up to six months (K=6) and, separately, up to a year (K=12). The parameters measuring persistent income risk in these cases will be denoted by $\sigma^2_{\varepsilon,k=0}$, $\sigma^2_{\varepsilon,k=6}$ and $\sigma^2_{\varepsilon,k=12}$ respectively.

Our intention is to estimate the parameters measuring income risk and see how changes in these parameters may be related to international trade. In order to this, we first estimate the income risk parameters at the industry level separately for each panel. Estimation of the income process parameters is discussed next.[8]

II.3. Estimation

Consider the change in the residual of income of individual i between period t and $t+n$ (we drop the subscript s for notational convenience, it is understood that the estimation exercises are conducted separately for each panel):

$$\Delta_n u_{ijt} = u_{ij,t+n} - u_{ijt} = \varepsilon_{ij,t+1} + \ldots + \varepsilon_{ij,t+n} + \eta_{ij,t+n} - \eta_{ijt}\ . \qquad (4)$$

We have the following expression for the variance of these income changes:

$$var[\Delta_n u_{ijt}] = \sigma^2_{\varepsilon j,t+1} + \ldots \sigma^2_{\varepsilon j,t+n} + \sigma^2_{\eta jt} + \sigma^2_{\eta j,t+n}\ . \qquad (5)$$

As noted earlier, the parameters $\sigma^2_{\varepsilon j}$ and $\sigma^2_{\eta j}$ are assumed to be constant within the period covered by a single SIPP panel (i.e., within each of the 1993, 1996 and 2001 panels).

Given this constancy, (5) can be written as:

$$var[\Delta_n u_{ijt}] = 2\sigma^2_{\eta j} + n\,\sigma^2_{\varepsilon j} \qquad (6)$$

[8] We discuss below the estimation of the parameters of (2) and (3). The estimation of income risk parameters when K>0 as in (2’) is entirely analogous.

Thus, the variance of observed n-period income changes is a linear function of n, where the slope coefficient is equal to $\sigma^2_{\varepsilon j}$. This insight, that the random walk component in income implies a linearly increasing income dispersion over time, is the basis of the estimation method used by several authors. Following Carroll and Samwick (1997), we estimate the parameters in (6) by regressing individual measures of $var[\Delta_n u_{ijt}]$ (that is the square of the individual deviation from mean income difference over the n periods) on n. (6) is estimated separately for each industry and panel. As is well recognized in the literature, the transitory term in the specification of the income process will absorb the measurement error in individual income. Given this and the fact that the welfare effects of transitory shocks to income are much smaller (as we have also discussed), we will focus on persistent shocks and their relation to trade policy.

II.4. Results

The preceding section provided a detailed description of a general econometric methodology that we use to estimate income risk given longitudinal data on individual incomes. Here, we note some additional issues that arise in applying this methodology to our data and report our risk estimates.

Since trade data is only available for the manufacturing sector, we restrict our sample to those workers employed in the manufacturing sector during the first month of each panel.[9] We assign individuals to those industries in which they were initially observed and maintain this industry assignment throughout. The risk estimates from this sample account for shocks to workers who experience income changes due to changes in their wage rates or the number of hours worked in their given jobs as well as those who change jobs within or between industries, allowing for intermediate periods of unemployment.[10] Using the methodology described in the preceding section, we

[9] Note that this restriction is not imposed on equation (1), which is estimated for all respondents of age 16 to 65 and were not enrolled in school during a given month, regardless of their industry affiliation.

[10] One issue that arises from assigning industries the way we described in constructing our baseline sample above is that individuals may experience shocks to income due to some changes in trade in the subsequent industry of employment, but this income change will be included in estimation of income risk in the initial industry of employment instead. However, the majority of displacements in our sample are within the same industry or to the non-manufacturing sector. This is consistent with the well-known findings of Davis, Haltiwanger, and Schuh (1996) that most job creation and destruction in

estimate the risk parameters σ_ε^2 and σ_η^2 in the three SIPP panels for each of the 18 manufacturing sectors in the US.[11]

Table II describes estimates obtained using our benchmark specification where transitory shocks are purely transitory and have no persistence at all ($\sigma_{\varepsilon,k=0}^2$) as well as when we allow for transitory shocks of longer duration ($\sigma_{\varepsilon,k=6}^2$ and $\sigma_{\varepsilon,k=12}^2$). As Table II indicates, the mean value of the monthly variance of the persistent shock, $\sigma_{\varepsilon,k=0}^2$, for the 1993 panel is estimated to be 0.003, or 0.036 annualized. For the 1996 panel, the corresponding estimate for $\sigma_{\varepsilon,k=0}^2$ is 0.004 (or 0.047 annualized), representing an average increase of about thirty percent. For the 2001 panel, it is 0.005 (or 0.0062 annualized). Table II also reports the estimates of $\sigma_{\varepsilon,k=6}^2$ and $\sigma_{\varepsilon,k=12}^2$. As expected, allowing for shocks of greater duration which are not permanent lowers our estimates of risk (by about fifty percent): The mean estimate of the monthly value of $\sigma_{\varepsilon,k=6}^2$ is 0.0018, 0.0024 and 0.0033 for the 1993, the 1996 and the 2001 panels (with corresponding annualized values of 0.0216, 0.0288 and 0.0396 respectively). As Table III also indicates, the estimates of $\sigma_{\varepsilon,k=12}^2$ are similar in magnitude to the estimates of $\sigma_{\varepsilon,k=6}^2$. This noted, we will henceforth focus simply on estimates $\sigma_{\varepsilon,k=0}^2$ and $\sigma_{\varepsilon,k=12}^2$. Greater detail on $\sigma_{\varepsilon,k=0}^2$ and $\sigma_{\varepsilon,k=12}^2$ is provided in Tables III-A and III-B which lists the industry level estimates of these parameters for each of the three SIPP panels.

It is informative to compare our estimates of the permanent component of income risk, σ_ε^2 with the estimates obtained by the extensive empirical literature on U.S. labor market risk using annual income data drawn from the PSID. Most of these studies find an average value of around 0.0225 for the annual variance σ_ε^2 (Carroll and Samwick (1997), Gourinchas and Parker (2002), Hubbard, Skinner and Zeldes (1994), and Storesletten, Telmer and Yaron (2004)), with a value of $\sigma_\varepsilon^2 = .0324$ being

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the United States takes place within industries. This is not an issue with Sample 1, described in the next section.

[11] Tobacco Products (SIC21) and Petroluem Refining (SIC 29) are omitted from our anlaysis due to an insufficient number of observations on individuals within these industries.

the upper bound (Meghir and Pistaferri, 2004). Thus, the average values of our estimates of permanent income risk, especially those that allow for transitory shocks of longer duration, are in line with the estimates that have been obtained by the previous literature on US labor market risk. Note that our results are obtained using SIPP, a three-year panel for the U.S., instead of the PSID data with a panel dimension of many years used in previous literature. The similarity of the estimates from the two datasets suggests that most income shocks we label "permanent" in this paper indeed persist for a very long time.

II.5.Income Risk in Sub Samples

Our dataset is sufficiently large enough to identify separate components of risk faced by different sub-samples of workers, allowing us to evaluate the relative importance of different channels through which international trade can affect individual income risk. In this section, we provide a description of our income risk estimates for these different sub-samples with particular emphasis on the type of risk we account for.

Our first sub sample is constructed by including only the individuals who were employed in the same manufacturing sector each month they were employed (and surveyed). This sample (denoted STAY-SIC2) includes workers who remained in the same job as well as those who switched jobs within the same industry (thereby possibly losing returns to firm or occupation specific capital). Displaced workers who move to a different manufacturing or non manufacturing sector are excluded from this sample and are instead grouped together in a different sample (SWITCH-ALL).

We then analyze the importance of switching industries on income risk using two different sub-samples. First, we construct a sample that includes individuals who stayed in manufacturing throughout but may have worked in a different manufacturing sector than their original sector at some point (STAY-MANUF). Then, we consider those individuals who switched to the non-manufacturing sector for at least one period in the panel (SWITCH-NON-MANUF).

Thus, we have four sub samples: STAY-SIC2, STAY-MANUF, SWITCH-ALL and SWITCH-NON-MANUF. Comparing income risk experienced by workers in these different sub samples will allow us to study the costs of switching sectors – both within and outside manufacturing.

Table IV provides a summary description of our estimates of income risk for the sub-samples described above for each panel. As these estimates indicate, $\sigma^2_{\varepsilon,k=0}$ continues to be greater than $\sigma^2_{\varepsilon,k=12}$ in each of the sub-samples. Note that income risk for those who stayed in the same manufacturing industry throughout the sample (STAY-SIC2) is the lowest, as these workers continue to earn returns on their industry-specific skills (even if they switch jobs within the sector). Next are the workers in STAY-MANUF who stay within manufacturing throughout but may have switched from one SIC2 to a different SIC2 industry at some point in time. Higher still are those workers in SWITCH-ALL who have switched to jobs in either a different manufacturing sector or have moved to a non manufacturing sector. Finally, the group with the highest risk are workers in SWITCH-NON-MANUF who switch out of the manufacturing sector altogether.

III. Trade and Income Risk

The procedure outlined in the previous section provides us with estimates of individual income risk, $\sigma^2_{\varepsilon js}$, for each industry j and SIPP panel, s. We now use these time-varying, industry-specific estimates in conjunction with observations on trade to examine the relationship between income risk, $\sigma^2_{\varepsilon js}$, and import penetration, M_{js}. In Figure 1, we plot the changes in estimated permanent income risk ($\Delta\sigma^2_{\varepsilon,k=0}$ and $\Delta\sigma^2_{\varepsilon,k=12}$) against changes in import penetration calculated at the beginning of each panel (more specifically, we plot differences between the 1993 and 1996 panels and between the 1996 and 2001 panels). In each case, i.e., for both K=0 and K=12, the relationship appears to be strongly positive suggesting that an increase in import penetration is associated with an increase in income risk for the workers in that industry.

III.1. Specification

More formally, we examine the relationship between income risk, $\sigma^2_{\varepsilon js}$, and import penetration, M_{js} using a linear regression specification that include industry fixed effects and time fixed effects:

$$\sigma^2_{\varepsilon js} = \alpha_0 + \alpha_s + \alpha_j + \alpha_M M_{js} + \nu_{js} . \quad (7)$$

In (7), the inclusion of industry dummies, α_j, in the specification allows us to control for any fixed industry-specific factors that may affect the level of riskiness of income in that industry. Moreover, the time dummy, α_s, controls for any changes in macroeconomic conditions that affect the level of income risk. While this ensures that our estimation results are not driven by changes in macroeconomic conditions (business cycle effects and/or long-run structural changes) unrelated to trade, it also means that identification of the relationship between $\sigma^2_{\varepsilon jt}$ and M_{js} will have to be based on the differential rate of change in import penetration across sectors over time. This, however, does not pose problems for our estimation since changes in import penetration over time do in fact exhibit substantial cross-sectional variation. For instance, the change in import penetration between 1993 and 1996 varies between -0.02 and 0.06, with a standard deviation of 0.02.

The estimates from (7) for our baseline sample reflect the risk faced by individuals in the manufacturing sector. By repeating this analysis for various sub-samples described in Section II.5, we will be able to evaluate the relative magnitudes of the different channels through which international trade could affect individual income risk.

III.2. Endogeneity and Selection Bias

One concern that potentially arises in our estimation of equation (7) which relates trade to income risk, is that import penetration may not be fully exogenous to income risk. While the large theoretical and empirical literature on the political economy of trade policy has not studied (or indeed even suggested) income risk as a determinant of cross-sectional variation in trade policy, it is possible that trade policy, which affects import penetration may itself be endogenously determined by income risk in the sector. Consider, that the government is "equity" minded and chooses higher protection levels for those industries with intrinsically high levels of income risk- thereby eliminating cross-sectional variation in income risk. If such an economy were studied purely in the cross section, it may appear that there is no relation between trade and income risk even though such a relationship does exist. However, this type of cross-sectional endogeneity is not particularly worrisome in our empirical analysis in which we follow industries over time. More precisely, our fixed effects estimator will be based on changes in income risk and trade, within industries over time, and will therefore eliminate any endogeneity bias deriving purely due to the cross-sectional variation in the determinants of trade policy.[12]

Another potential concern relates to the possibility that workers of different types may self-select into particular industries. Suppose, for example, that industries with high levels of import penetration are also industries with high job destruction rates. Suppose further that there are two types of workers, good and bad, and that good workers quickly find a new job in the event of job displacement, but bad workers do not. Other things being equal, we would expect bad workers to move to low import penetration industries (or, over time, to industries in which import penetration has increased to a smaller extent relative to others). This type of self-selection, if present, would bias the analysis against finding an association between income risk and import penetration. However, in our study, this concern is greatly mitigated for the following reasons. First, we examine industries over time, so any fixed differences across industries in worker characteristics are taken into account by our fixed effects estimation. Furthermore, we test whether the distribution of workers within an industry is related to change in import penetration in our data. We find that changes in the mean (and variance) of human capital (measured by educational attainment and proxying for worker type) within a sector are completely uncorrelated with changes in import penetration across the span of the three SIPP panels. Finally, since selection could be based on unobserved ability differences among workers that are uncorrelated with educational attainment, we examine this possibility as well. In this case, we

[12] Less emphasis has been placed in the literature on the determinants of the changes in trade policy over time. Nevertheless, we should note that we see absolutely no evidence of trade barriers responding to income risk changes in our data.

would expect selection to be reflected in unexplained wage differentials across sectors, at least as long as high-ability workers are paid higher wages. Our examination of the data suggests that such differentials are quite small and that there is little selectivity of workers of differing unobserved abilities into different sectors -- the R^2 of a simple cross-sectional regression of mean earnings on mean educational attainment itself is about 0.8 in our data. More importantly, changes in unexplained portion of industry average wages in this regression are uncorrelated with changes in import penetration, further mitigating our concern regarding selection bias. In any event, we must note that the selection of the nature we have discussed, would bias against finding a positive relationship between exposure to trade and income risk (and thus would only strengthen our results reported below).

III.3. Results

The results estimated for our full sample of workers using the specification described above are reported in Table V. We estimate two separate level regressions described by (7) using, separately, import penetration at the beginning of each panel (1993 and 1996 and 2001) and import penetration lagged one year (i.e., for 1992 and 1995 and 2000 respectively). For each specification, we use as the dependent variable, income risk measured by filtering out purely transitory shocks ($\sigma^2_{\varepsilon,k=0}$) and by filtering out transitory shocks that last up to a year ($\sigma^2_{\varepsilon,k=12}$).

We find that import penetration is significantly associated with income risk in each of the specifications we examine. With only purely transitory shocks are filtered out and when the independent variable is import penetration at the beginning of each panel, the coefficient on import penetration is estimated to be $\hat{\alpha}_M$ = 0.022. This estimate indicates that an increase in import penetration by ten percent of its initial (1993) level would raise $\sigma_{\varepsilon,k=0}$ by a little over five percent. When transitory shocks of up to a year's duration are filtered out instead the coefficient estimate is larger, $\hat{\alpha}_M$ = 0.045. This corresponds to an increase in σ_ε of about twenty three percent. When estimates from the specification used lagged values of import penetration are used instead, our estimates are very similar.

III.4. Results - Income Risk

In order to evaluate the effects of international trade on workers in different sub groups, we next repeat the analysis described above for various sub-samples described in Section II.5. These results are reported in Table VI. As before, the coefficients for each sub sample are estimates using income risk estimates $\sigma^2_{\varepsilon,k=0}$ and $\sigma^2_{\varepsilon,k=12}$ separately.

The first two columns of Table VI-A report results using income risk estimates $\sigma^2_{\varepsilon,k=0}$ from the sub-sample STAY-SIC2 as the dependent variable. When values of import penetration at the beginning of the panel are used as the explanatory variable, our estimates suggest that $\sigma_{\varepsilon,k=0}$ would increase by five percent as a result of an increase in import penetration by ten percentage of its initial value. When $\sigma^2_{\varepsilon,k=12}$ is the dependent variable, the same increase in import penetration results in an increase in $\sigma_{\varepsilon,k=12}$ of about twenty five percent.

When we examine workers who stay within manufacturing (staying either in the same manufacturing sector or moving to another sector within manufacturing), i.e., in sample STAY-MANUF, our estimates suggest that $\sigma_{\varepsilon,k=0}$ would increase by about five percent as a result of an increase in import penetration by ten percentage of its initial value and that the corresponding increase in $\sigma_{\varepsilon,k=12}$ is twenty two percent.

When we examine workers who switch sectors (either within manufacturing or to a non-manufacturing sector), i.e., workers in sample SWITCH-ALL, our estimates suggest that $\sigma_{\varepsilon,k=0}$ would increase by about four percent as a result of an increase in import penetration by ten percentage of its initial value and that the corresponding increase in $\sigma_{\varepsilon,k=12}$ is eighteen percent.

Finally, when we examine workers who switch to a non manufacturing sector, i.e., workers in sample SWITCH-NON-MANUF, our estimates suggest that $\sigma_{\varepsilon,k=0}$ would increase by about three percent as a result of an increase in import penetration by ten percentage of its initial value and that the corresponding increase in $\sigma_{\varepsilon,k=12}$ is twenty two percent. We should note that the estimated coeffeicients, while both positive, are significant only for the K=12 case.

III.5. Robustness

All the specifications reported in Tables V and VI include both industry and year fixed effects in addition to import penetration (measured at the beginning of each panel and one-year lagged). These estimates will be biased if there are time varying industry specific factors that are correlated with both income risk and import penetration simultaneously. In the analysis that follows we include additional explanatory variables to explore this possibility.

Specifically, we explore the following possibilities. First, we include share of exports in total sales. If the risk faced by individuals employed in the export sector is lower, and exporting industries face lower import competition, then omission of this variable could lead to an over estimation of the coefficient on import competition. A second concern is that industries with high levels of final good imports tend to import high levels of intermediate inputs. Increased imports of intermediate inputs could lead to an increase in income risk due to an increased elasticity of labor demand. On the other hand, outsourcing could insulate domestic workers from output volatility by shifting the non-core activities of an industry abroad and hence decreasing risk for those who remain. To address this issue, we include share of imported intermediate inputs as a measure of outsourcing. Third, if industries respond to increased import competition by investing in information and communication technologies (ICT) and if such technology increases the risk faced by workers (for example, by increasing their substitutability with machines) this would lead to an upward bias in our coefficient of interest. Finally we include share of foreign multinationals (MNE) in total industry employment. Exclusion of this variable could lead to an upward bias in the magnitude of the coefficient of import competition if an increase in MNE share is associated with a decrease in imports in that industry and if employment in such firms are more stable than that of domestic firms. In Table VII we report the summary statistics for each of these variables calculated at the beginning of each panel.

We report our results in Table VIII-A. As before, each specification reported includes industry and year fixed effects. In columns (1)-(4) import penetration as well as all other explanatory variables are measured at the beginning of each panel, whereas in columns (5)-(8) they are lagged by one year. For brevity, we report the results from the specification with income risk estimated allowing for transitory shocks that last up to a year as the dependent variable. In columns (2) and (6), we include share of exports in addition to share of imports. The coefficient of import penetration remains significant and positive with little change in its magnitude. The coefficient of exports is insignificant. Inclusion of outsourcing leads to an increase in the coefficient of import penetration. In the specifications reported here, the outsourcing variable is significant and negative. This suggests that an increase in outsourcing in an industry is associated with a decline in income risk in that industry. Inclusion of ICT does not affect the coefficient on import penetration.

Since the MNE measure comparable across time is available until 1996, we check the robustness of our results to the inclusion of this variable only for the 1993 and 1996 panels. For comparison, in Table VIII-B we repeat the analysis in Table VII-A excluding the 2001 panel. The coefficient on import penetration remains positive and significant in all the specifications. The exclusion of the 2001 panel results in an increase in the magnitude of the coefficient of interest. The coefficient on multinationals is positive and significant only in one of the specifications.

IV. Welfare

The preceding sections have focused on estimating the relationship between trade policy and income risk. We now turn to the analysis of the link between income risk and welfare using a simple dynamic model with incomplete markets provided by Krebs (2004). This model is tractable enough to permit closed-form solutions for equilibrium consumption and welfare, yet rich enough to provide a tight link to the empirical analysis we have outlined. Clearly, our goal here is not to provide a complete assessment of the effects of income risk on welfare taking into account all possible channels, but rather to obtain indicative estimates of welfare change through the income risk channel. The model features ex ante identical, long-lived workers who make consumption and saving choices in the face of uninsurable permanent income shocks and borrowing constraints. It can be shown that the welfare effects of the change in risk, Δ_σ, obtained by calculating the compensating variation in lifetime consumption, Δ_c. This is the change in consumption in each period and state of the world required to compensate the individual for this change and is given by:

$$\Delta_c = \left(\frac{1-\beta(1+\mu)^{1-\gamma}\exp(.5\gamma(\gamma-1)(1+\Delta_\sigma)\sigma_\varepsilon^2)}{1-\beta(1+\mu)^{1-\gamma}\exp(0.5\gamma(\gamma-1)\sigma_\varepsilon^2)} \right)^{\frac{1}{1-\gamma}} - 1 \quad \text{if } \gamma \neq 1 \qquad (9)$$

where β is the pure discount factor, γ the coefficient of relative risk aversion, c_o the initial consumption level, μ the mean growth rate of income, and σ_ε^2 the estimated variance of the permanent component of labor income shocks. Using (9) with estimates of Δ_σ due to trade (from Section III.3 and III.4) and standard values for the parameters β and γ, we can quantify the benefits or costs of trade through the income risk channel.

Our empirical results provided in the previous section suggest that an increase in import penetration is associated with an increase in income risk for the workers in that industry. Quantitative welfare analysis indicates that the costs of this increased risk are economically significant as well. We should note that the welfare effects depend on the duration of time for which increased import penetration raises income risk. While or estimates suggest that higher import penetration is associated with higher income risk forever, in the quantitative analysis we have allowed for income risk to be higher for shorter periods of time – for T = 5, 10 and 15 years. As Table VIII indicates, the increase in persistent income risk following a ten percent increase in import penetration is certainty equivalent to a reduction in lifetime consumption by almost five to ten percent (for standard parameter values of β = 0.98 and γ = 2). Welfare estimates corresponding to a lower level of risk aversion, γ = 1, are provided in Table VIII as well.

V. Conclusion

This paper studies the links between international trade and individual income risk using longitudinal income data on workers in the United States. The analysis proceeds in two steps. First, the income data on workers from the Survey of Income and Program Participation (SIPP) are used to estimate industry-level time-varying individual income risk parameters for the US economy. Second, we combine these estimates of the persistent component of labor income risk with measures of exposure to international trade to identify the link between labor income risk and trade. We find increased import penetration to have a statistically and economically significant effect on labor income risk in the US. Importantly, we then repeat this analysis for different sub-samples of workers, such as those who switched to a different industry or sector or those who remained in the same industry throughout the sample. This allows us to identify these separate components of risk faced by individuals and to evaluate the relative importance of the different channels through which international trade can affect individual income risk.

We emphasize here again that our analysis has focused exclusively on the link between trade and income risk. It is complementary to the findings of a large literature on international trade, which has explored the many ways in which exposure to trade may positively affect the economy.

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Table I. Summary Statistics

	1993		**1996**		**2001**	
Variable	*Mean (All)*	*Mean (Manuf.)*	*Mean (All)*	*Mean (Manuf)*	*Mean (All)*	*Mean (Manuf)*
Log (Real Earnings)	7.34	7.64	7.37	7.61	7.46	7.67
Age	35.39	37.51	36.62	37.97	37.40	39.34
Variable	*Percent (All)*	*Percent (Manuf)*	*Percent (All)*	*Percent (Manuf)*	*Percent (All)*	*Percent (Manuf)*
High school drop out	17.53	19.55	11.49	14.77	11.55	13.78
High school graduate	38.1	43.86	36.37	43.51	33.87	41.07
Some college	21.92	19.26	29.76	26.07	30.11	27.06
College graduate	12.73	10.96	15.51	11.77	16.69	13.25
More than college	9.72	6.37	6.87	3.88	7.79	4.85
Female	48.32	32.72	49.04	35.63	48.68	32.76
Married	56.99	64.35	57.75	62.87	56.32	62.44
White	78.37	78.35	73.05	73.33	69.72	69.97
N	24,998	4,471	41,008	7,270	37,579	5,647

Table II. Risk Estimates

	Mean	**Median**	**Std. Dev.**
1993-1995			
$\sigma^2_{\varepsilon,k=0}$	0.0033	0.0031	0.0016
$\sigma^2_{\varepsilon,k=6}$	0.0018	0.0015	0.0016
$\sigma^2_{\varepsilon,k=12}$	0.0014	0.0014	0.0019
1996-1998			
$\sigma^2_{\varepsilon,k=0}$	0.0043	0.0042	0.0013
$\sigma^2_{\varepsilon,k=6}$	0.0024	0.0023	0.0014
$\sigma^2_{\varepsilon,k=12}$	0.0025	0.0026	0.0018
2001-2003			
$\sigma^2_{\varepsilon,k=0}$	0.0052	0.0051	0.0016
$\sigma^2_{\varepsilon,k=6}$	0.0033	0.0034	0.0019
$\sigma^2_{\varepsilon,k=12}$	0.0031	0.0032	0.0025

Table III-A Risk Estimates by Industry for each Panel ($\sigma^2_{\varepsilon,k=0}$)

SIC	1993-1995		1996-1998		2001-2003	
	$\sigma^2_{\varepsilon,k=0}$	N	$\sigma^2_{\varepsilon,k=0}$	N	$\sigma^2_{\varepsilon,k=0}$	N
20	0.004*** (0.0002)	88,481	0.004*** (0.0001)	164,063	0.005*** (0.0002)	124,443
22	0.006*** (0.0003)	40,609	0.003*** (0.0002)	61,924	0.004*** (0.0003)	31,315
23	0.003*** (0.0002)	53,716	0.005*** (0.0002)	98,627	0.009*** (0.0004)	45,322
24	0.004*** (0.0003)	48,251	0.005*** (0.0003)	72,618	0.004*** (0.0002)	60,215
25	0.003*** (0.0003)	31,146	0.003*** (0.0003)	54,938	0.002*** (0.0003)	43,780
26	0.003*** (0.0002)	46,081	0.004*** (0.0002)	69,061	0.005*** (0.0003)	49,806
27	0.005*** (0.0002)	112,856	0.004*** (0.0002)	143,778	0.005*** (0.0002)	110,806
28	0.003*** (0.0002)	90,748	0.004*** (0.0002)	116,748	0.006*** (0.0002)	93,479
30	0.002*** (0.0003)	59,445	0.003*** (0.0002)	89,049	0.007*** (0.0003)	62,880
31	-0.000 (0.0007)	2,925	0.003*** (0.0005)	10,038	0.004*** (0.0004)	6,915
32	0.005*** (0.0003)	34,316	0.004*** (0.0002)	63,190	0.006*** (0.0003)	46,769
33	0.002*** (0.0002)	53,139	0.004*** (0.0002)	77,627	0.005*** (0.0003)	48,049
34	0.004*** (0.0001)	91,221	0.003*** (0.0001)	142,675	0.004*** (0.0002)	103,207
35	0.002*** (0.0001)	152,489	0.004*** (0.0001)	245,656	0.005*** (0.0001)	167,864
36	0.003*** (0.0001)	136,858	0.003*** (0.0001)	217,116	0.005*** (0.0002)	151,539
37	0.003*** (0.0001)	177,427	0.005*** (0.0001)	259,820	0.005*** (0.0001)	186,520
38	0.002*** (0.0002)	53,364	0.005*** (0.0002)	78,029	0.006*** (0.0003)	53,595
39	0.006*** 0.0004322	27,410	0.008*** 0.0003832	50,487	0.007*** 0.000404	39,194

Robust standard errors in parantheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table III-B Risk Estimates by Industry for each Panel ($\sigma^2_{\varepsilon,k=12}$)

SIC	1993-1996		1996-1998		2001-2003	
	$\sigma^2_{\varepsilon,k=12}$	N	$\sigma^2_{\varepsilon,k=12}$	N	$\sigma^2_{\varepsilon,k=12}$	N
20	0.003*** (0.0005)	32,315	0.000 (0.0004)	59,324	0.004*** (0.0005)	45,940
22	0.005*** (0.0008)	15,083	-0.000 (0.0006)	21,953	0.004*** (0.0009)	11,589
23	0.001** (0.0006)	19,336	0.004*** (0.0007)	34,762	0.010*** (0.0011)	16,128
24	0.003*** (0.0008)	17,205	0.006*** (0.0008)	26,056	0.002*** (0.0006)	22,208
25	-0.000 (0.0010)	11,069	0.001 (0.0008)	19,575	0.002*** (0.0007)	16,032
26	0.001** (0.0006)	17,242	0.004*** (0.0006)	25,537	-0.000 (0.0008)	18,420
27	0.002*** (0.0005)	41,223	0.003*** (0.0005)	51,985	0.001 (0.0006)	40,783
28	0.001* (0.0005)	33,936	0.001** (0.0005)	42,437	0.003*** (0.0005)	35,130
30	-0.002*** (0.0007)	22,437	0.000 (0.0005)	32,779	0.006*** (0.0008)	23,142
31	-0.001 (0.0016)	1,019	0.003** (0.0012)	3,558	0.006*** (0.0010)	2,476
32	0.004*** (0.0010)	13,075	0.003*** (0.0007)	22,975	0.004*** (0.0009)	17,241
33	-0.001*** (0.0006)	19,692	0.001** (0.0005)	28,164	-0.001 (0.0008)	17,826
34	0.003*** (0.0004)	33,224	0.002*** (0.0004)	53,227	0.001** (0.0004)	37,893
35	0.001*** (0.0003)	57,265	0.002*** (0.0004)	89,855	0.002*** (0.0005)	61,912
36	0.002*** (0.0003)	50,799	0.002*** (0.0003)	80,023	0.002*** (0.0005)	56,591
37	0.002*** (0.0004)	66,055	0.003*** (0.0004)	95,492	0.003*** (0.0004)	69,297
38	0.001** (0.0006)	19,743	0.005*** (0.0006)	28,117	0.003*** (0.0008)	20,051
39	0.001 0.0014128	9,860	0.005*** 0.001174	17,357	0.005*** 0.0011836	14,032

Robust standard errors in parantheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table IV. Income Risk in Sub-Samples

	$\sigma^2_{\varepsilon,k=0}$		$\sigma^2_{\varepsilon,k=12}$	
1993-1995	Mean	Std. Dev.	Mean	Std. Dev.
SWITCH_NON-MANUF	0.0063	0.0033	0.0026	0.0053
SWITCH_ALL	0.0059	0.0029	0.0029	0.0050
STAY_MANUF	0.0027	0.0014	0.0011	0.0019
STAY_SIC2	0.0024	0.0012	0.0008	0.0016
1996-1998				
SWITCH_NON-MANUF	0.0082	0.0031	0.0036	0.0055
SWITCH_ALL	0.0067	0.0026	0.0030	0.0043
STAY_MANUF	0.0033	0.0010	0.0021	0.0017
STAY_SIC2	0.0031	0.0008	0.0021	0.0015
2001-2003				
SWITCH_NON-MANUF	0.0090	0.0032	0.0039	0.0057
SWITCH_ALL	0.0081	0.0026	0.0033	0.0036
STAY_MANUF	0.0039	0.0017	0.0024	0.0023
STAY_SIC2	0.0037	0.0017	0.0025	0.0025

Table V. International Trade and Income Risk: Full Sample

	$\sigma^2_{\varepsilon,k=0}$		$\sigma^2_{\varepsilon,k=12}$	
Import penetration (Lagged)	0.023** (0.009)		0.042*** (0.014)	
Import penetration		0.022** (0.010)		0.045*** (0.013)
Constant	0.003*** (0.000)	0.003*** (0.000)	0.001 (0.001)	0.001 (0.001)
R-squared	0.71	0.70	0.58	0.60
N	54	54	54	54

Robust standard errors in parantheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table VI-A International Trade and Income Risk: Sub-Samples ($\sigma^2_{\varepsilon,k=0}$)

	STAY SIC2		STAY MANUF		SWITCH ALL		SWITCH NON-MANUF	
Import Penetration (Lagged)	0.017** (0.0084)		0.019* (0.0097)		0.028* (0.0157)		0.023 (0.0201)	
Import Penetration		0.015* (0.0089)		0.017* (0.010)		0.027 (0.0169)		0.024 (0.0218)
Constant	0.002*** (0.0002)	0.002*** (0.0003)	0.002*** (0.0003)	0.002*** (0.0007)	0.007*** (0.001)	0.007*** (0.0011)	0.008*** (0.001)	0.008*** (0.0014)
R-squared	0.59	0.58	0.62	0.61	0.61	0.61	0.55	0.55
N	54	54	54	54	54	54	54	54

Robust standard errors in parantheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table VI-B International Trade and Income Risk: Sub-Samples ($\sigma^2_{\varepsilon,k=12}$)

	STAY SIC2		STAY MANUF		SWITCH ALL		SWITCH NON-MANUF	
Import Penetration (Lagged)	0.028* (0.0158)		0.031* (0.0159)		0.070*** (0.0240)		0.081** (0.0330)	
Import Penetration		0.031* (0.0157)		0.034** (0.0157)		0.070*** (0.0251)		0.081** (0.0344)
Constant	0.000 (0.0008)	0.000 (0.0009)	0.001 (0.0008)	0.000 (0.0009)	0.003 (0.0027)	0.003 (0.0028)	0.002 (0.0033)	0.002 (0.0034)
R-squared	0.50	0.51	0.51	0.53	0.50	0.49	0.42	0.42
N	54	54	54	54	54	54	54	54

Robust standard errors in parantheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table VII Summary Statistics: Explanatory Variables

Variable	Mean	Std. Dev.	Min	Max
1993				
Import Penetration	0.169	0.140	0.014	0.561
Share of Exports	0.101	0.063	0.022	0.235
Outsourcing	0.148	0.082	0.039	0.324
Share of ICT	0.080	0.058	0.029	0.225
Share of MNE	0.119	0.074	0.027	0.330
1996				
Import Penetration	0.192	0.158	0.015	0.638
Share of Exports	0.122	0.080	0.022	0.282
Outsourcing	0.160	0.080	0.047	0.352
Share of ICT	0.082	0.057	0.028	0.219
Share of MNE	0.117	0.070	0.021	0.307
2001				
Import Penetration	0.234	0.178	0.019	0.717
Share of Exports	0.138	0.092	0.023	0.320
Outsourcing	0.192	0.097	0.054	0.393
Share of ICT	0.082	0.057	0.024	0.222

These summary statistics are calculated at the beginning of each panel. Share of MNE is not available after 1996 and for industries 25 (Furniture and Fixtures) and 31 (Leather and Leather Products).
Import Penetration=Imports/Shipments-exports+imports
Share of Exports=Exports/Shipments

$$\text{Outsourcing} = \sum_j \left[\frac{\text{purchases of input } j \text{ by industry } i \text{ at time } t}{\text{total non-energy inputs used by industry } i \text{ at time } t} \right] * \left[\frac{\text{imports of input } j \text{ at time } t}{\text{production}_j + \text{imports}_j - \text{exports}_j \text{ at time } t} \right]$$

Share of ICT= (Software+Computers and peripheral equipment+Communication equipment + Photocopy and related equipment+Instruments)/K. *Source: BEA, NIPA*
Share of MNE= Employment of non-bank US affiliates by industry of sales , as a percentage of total US employment in non-bank private industries. *Source: BEA*

Table VIII-A Robustness ($\sigma^2_{\varepsilon,k=12}$)

Full Sample	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Import Penetration (lagged)	0.042*** (0.014)	0.044** (0.020)	0.050** (0.019)	0.049** (0.020)				
Share of exports (lagged)		-0.005 (0.018)	-0.002 (0.019)	-0.001 (0.020)				
Outsourcing (lagged)			-0.023* (0.011)	-0.022* (0.012)				
Share of ICT (lagged)				0.020 (0.036)				
Import Penetration					0.045*** (0.013)	0.045** (0.019)	0.057*** (0.020)	0.056** (0.021)
Share of exports						0.000 (0.016)	0.001 (0.017)	0.004 (0.017)
Outsourcing							-0.044** (0.018)	-0.043** (0.019)
Share of ICT								0.031 (0.034)
Constant	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.000 (0.002)	0.001 (0.001)	0.001 (0.001)	0.002 (0.001)	0.000 (0.002)
R-squared	0.58	0.58	0.61	0.61	0.60	0.60	0.63	0.64
N	54	54	54	54	54	54	54	54

Robust standard errors in parantheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table VIII-B Robustness ($\sigma^2_{\varepsilon,k=12}$)

1993 and 1996 panels	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Import Penetration (lagged)	0.074* (0.039)	0.092** (0.031)	0.103*** (0.030)	0.101** (0.035)				
Share of exports (lagged)	-0.015 (0.034)	-0.016 (0.027)	-0.017 (0.026)	-0.013 (0.028)				
Outsourcing (lagged)		-0.109 (0.119)	-0.069 (0.126)	-0.075 (0.125)				
Share of ICT (lagged)			0.123 (0.112)	0.133 (0.121)				
Share of MNE (lagged)				0.014 (0.056)				
Import Penetration					0.093** (0.032)	0.091*** (0.027)	0.090*** (0.026)	0.109*** (0.025)
Share of exports					-0.016 (0.027)	-0.017 (0.020)	-0.009 (0.015)	-0.010 (0.014)
Outsourcing						-0.068*** (0.019)	-0.069*** (0.018)	-0.152*** (0.035)
Share of ICT							0.123 (0.089)	0.307* (0.1386)
Share of MNE								0.126** (0.053)
Constant	-0.001 (0.002)	0.004 (0.006)	-0.005 (0.012)	-0.007 (0.015)	-0.001 (0.002)	0.002 (0.002)	-0.005 (0.006)	-0.025* (0.012)
R-squared	0.72	0.75	0.77	0.77	0.76	0.80	0.82	0.88
N	32	32	32	32	32	32	32	32

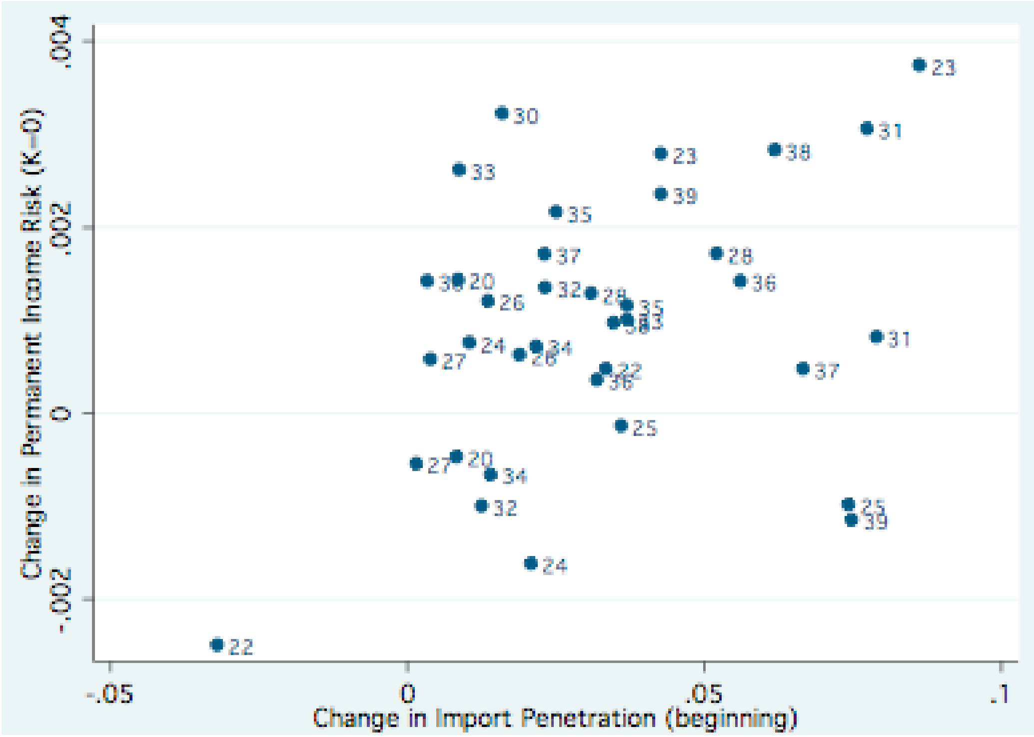
Robust standard errors in parantheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table VIII. Welfare Effects (Percent of Lifetime Consumption)

		T=5	T=10	T=15
K=0	$\gamma = 1$	1.00	1.91	2.75
	$\gamma = 2$	2.07	4.09	6.04
K=12	$\gamma = 1$	2.06	3.95	5.70
	$\gamma = 2$	4.01	7.56	10.70

Figure 1. Changes in Permanent Income Risk and Changes in Import Penetration

i. K=0



ii. K=12