

Income Smoothing and Welfare Gains Across Pacific Island Countries: The Role of Remittances and Financial Aid and Savings

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Abstract

In this paper, we examine the potential welfare gains and channels of income smoothing for 14 Pacific Island countries (PIC). We find that the overall welfare gains across all PIC (in particular Kiribati, Palau and Papua New Guinea) are higher than the potential gains from risk sharing for OECD countries, under full risk-sharing. However, for Australia, the potential welfare gains from risk sharing is almost similar to the gains they obtain when Australia has full risk sharing with the rest of the OECD countries or with New Zealand alone. We also break down output using the framework of Sørensen and Yosha(1998) to quantify the extent and channels of risk sharing across the PIC. We find that, for PIC, income-smoothing channels (in particular, current transfers and net factor income) play a significant role in buffering the domestic-output shock compared to the effect of those channels on income smoothing for OECD members. Domestic savings also smooth a fair portion of shocks to output, but the extent is much lower compared to the magnitude of savings channels on smoothing for OECD countries. In a novel approach, we analyze the effect of remittances and financial aid on income smoothing for the less developed portion of PIC. We find that income smoothing via remittances has been highly volatile, and significant in recent years, financial aid seems stronger and stabler channel for smoothing domestic-output shocks for PIC.

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1 Introduction

Throughout the world, the economic unions are having a greater importance to in promoting economic growth and welfare. Following the European Union (EU), the emerging markets of Eastern Asia, oil-rich Middle East economies and others are forming (or aim to form) economic (and monetary) unions to promote economic growth and welfare gains from each other. ¹ These economic (and monetary) unions are often motivated to be formed by both developed and emerging economies-expansion of the EU to Central and Eastern Europe is a good example-even though emerging market economies with a history of relatively high macroeconomic volatility may raise concerns for the integration. PIC, only created a forum rather than an economic union; they are debating whether to harmonize and unify social, fiscal, and monetary policies- i.e to form an economic union- in the future. Indeed, potential welfare gains associated with the integration of economies motivate countries to form an economic union. ²

In this paper, we first estimate the potential gains from economic and financial integration for the Pacific Island region. We particularly define that integration as the degree to which a country's consumption is independent from country-specific output shocks -so-called risk sharing. Full risk sharing is defined the case in which all country-specific output shocks (changes in terms of trade, fluctuations in production, policy reforms, natural disasters, etc.) are completely diversified and the output volatility of an individual country is not reflected in its consumption. We show empirically that when the PIC move towards full risk sharing, all(or some) of them gain from diversifying country-specific risks. The advantages of integration are often questioned because of the recent financial crises and instability in a number of the emerging markets (see Rodrik, 1998; Stiglitz, 2002). While excessive output volatility is undesirable for any economy, the inability of individual mem-

¹Central and West African Monetary unions are also followers of EU. East African Community, Caribbean Single Market and Economy, Union of South American Nations are other economic unions, that are scheduled to be formed in the near future.

²The Pacific Islands Forum; founded, in 1971 is a political grouping of 16 independent and self-governing states which aims to enhance cooperation between the member countries and represent their interests. The forum includes Australia, Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

bers of an economic(or monetary) union to reduce the impact of the adverse output shocks by monetary and exchange-rate policy instruments is a major concern for the current and future members of the unions. Even though the adverse supply shocks among members in the union lead to difficulties in having stable instruments, the full capital mobility version of optimum currency area literature by Mundell (1973) states that macroeconomic asymmetry does not preclude countries from forming economic and currency unions as long as they effectively share their output risks. Clearly, the desirability of economic and possible monetary integration should take into account the risk-sharing opportunities that the integration brings. Empirically we measure each country's potential welfare gains in the case of full risk sharing, compared to the autarky position.³

As we pointed out earlier, the risk sharing between countries in the economic (monetary) unions can increase welfare.⁴ However, even among the European Monetary Union members(EMU), the total risk sharing is not at desirable levels.⁵At this stage, policy makers ought to consider taking various actions such as promoting international goods and financial assets trade, labor movements and financial aid to attain full risk sharing between countries. There are different ways that countries can obtain risk sharing which we refer to as channels of risk sharing. The main channels are cross-ownership of assets(short term labor) that “smooth” income (making income growth in a country less sensitive to output growth in that country), transfers(remittances and financial aid) that smooth disposable income for given income, and borrowing and lending that smooth consumption for given disposable income. Asdrubali, Sørensen, and Yosha (1996) (ASY) derive a simple way of quantifying the relative contributions of various channels of income and consumption smoothing within a common framework. ASY find, for the U.S. that market institutions provide the bulk of risk sharing through income smoothing. Sørensen and Yosha (1998) and

³Optimum currency area (OCA) literature by Mundell (1961) and McKinnon (1963) suggests that the lack of independent monetary policy may lead to a significant loss of welfare and even breakdown of monetary union if the union members exhibit non-synchronized (or asymmetric) output fluctuations and international capital mobility is limited.

⁴Specifically, the full risk sharing is the situation where consumption grows at identical rates in all countries as full risk sharing and we label the growth rate of a country-level variable minus the union-wide counterpart as the “idiosyncratic” growth-rate. We consider risk sharing to be higher the less idiosyncratic consumption growth co-varies with idiosyncratic income growth.

⁵Asdrubali, Sørensen, and Yosha (1996) found that for the U.S., total risk sharing is around 70-80 percent. Basher et al. (2009) found a similar percentage Canada. For the EU, it drops below 50 percent.

Balli and Sørensen (2007) use similar methods to evaluate channels of risk sharing between countries in the EU and in the Organization for Economic Cooperation and Development (OECD). They find that the bulk of risk sharing was provided by pro-cyclical government saving with some risk sharing provided by corporate saving at shorter horizons.⁶

Further, we estimate the measures of channels of risk sharing employing ASY(1996) and SY(1998) methodologies for this paper. Empirically, we analyze various risk-sharing channels for the fourteen PIC to unveil the current state of risk sharing. In addition to the typical channels of risk sharing innovated by SY(1998), we decompose the magnitude of income smoothing via international transfers as net remittance inflows and financial aid and find that the magnitudes of these channels are significant to smooth some portion of the domestic output shocks. To the best of our knowledge, our approach to measuring income smoothing via immigrant and nonimmigrant inflows and financial aid is the first in the literature.

Applying both empirical frameworks, our results can be summarized as follows: for the less developed portion of PIC, the potential welfare gains from full risk sharing are higher than those achieved by OECD members under full risk-sharing. For New Zealand, the welfare gains are higher compared to the welfare gains, New Zealand is to achieve when it attains full risk sharing with the OECD members or only Australia . For Australia, the gains from risk sharing with PIC is at the same level, compared to the potential gains of full risk sharing by Australia with OECD members.

Considering the channels of risk sharing, smoothing via net factor income flows plays significant role in risk sharing among PIC without Australia and New Zealand (A&NZ). This channel is mostly driven by the effect of net compensation of employees from the rest of the world.⁷ International transfers, in particular remittances (in the last years) and financial aids are effective in absorbing the domestic output shock for the less developed portion of PIC. This channel is not effective for OECD members, where remittance transfers and financial aid to OECD members is negligible. International transfers, in particular

⁶Soyoung et al. (2006) and Kim and Sheen (2007) employ the same methodology and measure the channels of risk sharing for Eastern Asian countries and Australia and New Zealand respectively.

⁷Compensation of employees—what the IMF’s Balance of Payments termed labor income until 1995—are funds transferred to countries of origin by nationals who have been abroad less than 12 months.

remittances(in the last years) and financial aid are effective in absorbing the domestic output shock for the less developed portion of PIC. This channel is not effective for OECD members, where the extent of the remittance transfers and financial aid to OECD members is quite low. Lastly, due to the ineffectiveness of the credit markets, the savings channel-although this corresponds to a fair portion of the total risk sharing for PIC- PIC(both including and excluding A&NZ) is able to smooth a lower amount of domestic output shocks compared to the OECD members. Lastly, due to the ineffectiveness of the credit markets, the savings channel for PIC (both including and excluding A&NZ - although this corresponds a to a fair portion of the total risk sharing for PIC) - is able to smooth a lower amount of domestic output shocks compared to the OECD members.

The remainder of this paper is organized as follows: Section two discusses the data and presents the descriptive statistics. Section three contains the model and empirical results for potential gains from risk sharing. Section four presents the theoretical background of risk sharing and channels of risk sharing, provides the channels of risk sharing for PIC and compares the results with channels of risk sharing for OECD members. Section five documents risk sharing via net remittance inflows and financial aid for PIC and Section six concludes the paper.

2 Data and Descriptive Statistics

We employ a large dataset to measure the channels of risk sharing and to calculate potential welfare gains from risk sharing for PIC for the years 1981 to 2007.⁸ National Accounts data, i.e., GDP, Gross National Income(GNI), Net National Income(NNI), Net Disposable Income(NDI) and government and private consumption are all obtained from the United Nations National Accounts Statistics: Main Aggregates and Detailed Tables(2008). Population, and exchange rates are obtained from the UN National Accounts Database. The Consumer price index of each country is obtained from IMF's International Financial Statistics Database. By dividing each national account unit(for example GDP) by

⁸PIC include Australia, Fiji, French Polynesia, Kiribati, Marshall Islands, Micronesia, New Caledonia, New Zealand, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Vanuatu. Cook Islands and Talau are excluded due to the lack of data.

country population, and by deflating each countrys CPI, we transform the GDP series into real per-capita terms. For OECD members, the national accounts data is taken from the OECD National Accounts, Main Aggregates (Volume I) and Detailed Tables (Volume II). The OECD countries in our sample consist of all OECD members except Luxembourg (very small and atypical), Iceland (incomplete data), and Czech Republic, Hungary, Korea, Mexico, Poland, Slovakia, and Turkey (less developed countries). Remittance data in USD is obtained from World Bank’s Migration and Development Brief 2009, prepared by Migration and Remittances Team, Development Prospects Group. Financial Aid data is obtained from World Bank’s development Indicators database(WDI).

Table 1 reports the summary statistics for real GDP and consumption per-capita growth rates of individual countries for the period of 1981–2007. The first two columns report the mean and standard deviation of real GDP growth rates. Overall, the annual growth rate for PIC averages 0.36% . The rate drops to 0.26%, when we exclude A&NZ. The standard deviation of output growth for PIC is 3.84. The standard deviation is at similar levels when we drop A&NZ. The third and fourth columns show the mean and standard deviation of real consumption growth rates. Unlike GDP growth rates, the consumption growth rates are higher for PIC. The average consumption growth rate is 0.85% which is two and a half times that of the GDP growth rate. It is more likely that international transfers(remittances and financial aid) injected to the less developed portion of PIC, promote the consumption growth. Even if we exclude A&NZ, the consumption growth rate is at similar levels. The last two columns report the correlations of output and consumption with aggregate PIC, GDP and consumption growth. The correlations of output are larger than those of consumption, consistent with the international consumption correlation puzzle documented by Backus et al. (1992).

3 Potential Gains From risk Sharing

Indeed, there are some welfare gains when countries perfectly diversify their idiosyncratic output shocks and smooth out their consumption. Economists attempted to measure the potential welfare gains from consumption risk sharing by comparing the level of welfare

gains of complete markets economy (full risk sharing) with the incomplete markets (autarky) economy. In this section, we follow Kalemli et al. (2001) to estimate the potential welfare gain of each PIC member if they attain complete risk sharing with other countries in the region.

3.1 Utility-based measures of gains from international risk sharing

Kalemli et al. (2001)'s main assumption is a closed-form expression that can be derived for the welfare gains that are achieved by moving from financial autarky to full risk sharing. To calculate the potential welfare gains from risk sharing, they compare the expected utility of consuming each country's own per capita (autarky) with that of consuming the country-specific portion of the aggregate output under full risk sharing among groups of economies. The difference between the utilities is called the potential gains from risk sharing. The gains are expressed in the permanent increase in the level of each country's consumption.⁹

Kalemli et al. (2001) formulated the gains for logarithmic utility as;¹⁰

$$G_i^K = 100 * \frac{1}{\delta} \left(\frac{1}{2} \sigma^2 + \frac{1}{2} \sigma_i^2 - cov_i \right). \quad (1)$$

We use G_i^K as Kalemli et al. (2001)'s measure of the potential gains from risk sharing for country i . δ is the inter-temporal discount rate.¹¹ σ^2 is the group-wide per capita GDP growth rate, σ_i is the variance of country i 's per capita GDP growth rate, and cov is the covariance of the country i 's GDP per capita with the group-wide GDP per capita. The equation can be interpreted as follows: higher gains are attained with a lower covariance since countries with asymmetric output growth are certainly being compensated in the risk sharing agreement to provide insurance for other countries (as well as to be compensated from other countries) by stabilizing aggregate output growth. Similarly, a country with a higher variance of output will benefit more from sharing risk with other countries. The higher the variance of the aggregate group-wide output, the more other countries would be willing to "pay" to country i for joining the risk-sharing arrangement because it provides

⁹Kalemli et al. (2001) derived utility gain measurement from the general CRRA utility function of $U(c) = c^{(1-\gamma)/(1-\gamma)}$, where γ the coefficient of relative risk aversion.

¹⁰The derivation of the formula can be found at Kalemli et al. (2001) pages 130–135.

¹¹Generally, previous studies employ delta in the range of 0.02 to 0.04.

additional diversification opportunities for all. We call the gains calculated by Eq. (1) as Kalemli et al. gains.

The second column of Table 2 reports the potential welfare gains that each PIC member is able to attain if full risk sharing exists within the region. The potential gains for smaller economies of PIC, Kiribati, Palau, French Polynesia and Vanuatu are in higher magnitudes. Even relative bigger economies of PIC, Fiji and Papua New Guinea, have higher potential welfare gains, compared to the potential gains of OECD countries, where Kalemli et al.(2001) estimate, that on average OECD members' gains from risk sharing is less than 1% when OECD members attain full risk sharing with each other.¹² The relatively large welfare gains for the PIC are primarily driven by the high volatility of output and consumption(see table 1), in particular for Kiribati, Palau and Papua New Guinea. Countries with largest variance and counter-cyclical pattern of output growth would contribute most for stabilizing the aggregate consumption in the region. We also find that for New Zealand, the gain from full risk sharing with other PIC is higher than OECD averages. Our finding for New Zealand is similar with Kim and Sheen(2007)'s findings where they calculate the potential gains for full risk sharing for New Zealand and they find that it is higher when Australia and New Zealand have full risk sharing than when A&NZ or (New Zealand by itself) have full risk sharing with other OECD members. For Australia, the gains from full risk sharing with other PIC members is very low, again similar to the Kim and Sheen(2007)'s findings. Unlike New Zealand, this findings would not motivate Australia to be attain full risk sharing with other PIC.

4 Full Risk Sharing and Perfect Consumption Smoothing: Theory

The basic theory of international risk sharing is well known—see Obstfeld and Rogoff (1996)—and we only outline the basic ideas for endowment economies with one homogeneous tradable good. Period t per capita output of country i is an exogenous random

¹²Recently, Demyank and Volosovych (2008), by employing the same methodology, found that old EU members gain from risk sharing in the amount of 0.69% in average for the period 1994–2005.

variable with a commonly known probability distribution. The representative consumer of each country is a risk averse expected utility maximizer.¹³ Consumers within each country are identical with Constant Relative Risk Aversion utility functions and perfect Arrow-Debreu markets for contingent claims exist. Optimal consumption then satisfies the full risk sharing relation where k^i is a country specific constant, c_t^i is country i per capita consumption, and c_t^W is world per capita consumption in period t . When risk is fully shared among countries, the consumption of a country co-moves with world consumption but not with country specific shocks.

A testable implication is that consumption growth rates are identical for all countries; i.e., $\Delta \log c_t^i = c + \Delta \log c_t^W + \epsilon_{it}$, where c is a constant and ϵ_{it} is an error term—due to either taste shocks or noise. An implication is that after controlling for aggregate consumption growth, the consumption growth rate of a country should not be a function of output growth of that country. Regression based tests for full risk sharing at the country level were conducted by Obstfeld (1994), Canova and Ravn (1996) and Lewis (1996)—see Lewis (1995) for a comprehensive survey.¹⁴

It is of more interest to quantify the extent of risk sharing between countries rather than test the abstract ideal of perfect risk sharing. It is also interesting to identify the exact channels through which risk is shared and to quantify the amount of risk sharing obtained via each channel. SY (2008) developed a method for answering these questions. In the Appendix section, we explain the methodology used by SY to derive the channels of risk sharing, in detail.

4.1 Channels of income insurance and consumption smoothing

There are several mechanisms for sharing risk. The most straightforward way of sharing risk internationally is through international income diversification; i.e., through cross-border

¹³We do not consider non-separabilities in the utility function between consumption and leisure or non-tradable output. See Canova and Ravn (1996) and Lewis (1996) for a treatment of these issues in the context of international risk sharing.

¹⁴The first tests for full risk sharing, using individual-level data were performed by Cochrane (1991), Mace (1991) and Townsend (1994). The International Real Business Cycle literature, most notably Backus, et al. (1992), Baxter and Crucini (1995) and Stockman and Tesar (1995) have examined the prediction that the correlation of consumption across countries should be equal to unity. The data are, however, far from confirming that prediction.

ownership of productive assets. Net income from foreign assets is reflected in the National Accounts data as the difference between Gross Domestic Product (GDP) and Gross National Income (GNI). If risk is not fully shared through factor income flows, there are further possible channels for smoothing consumption. Depreciation doesn't vary one-to-one with GDP—this source of risk sharing is not very interesting but it needs to be included if we want to consider all “wedges” between GDP and consumption. GNI minus depreciation is (net) National Income (NI). NI can be smoothed through international transfers. We refer to NI plus net (incoming) international transfers as Disposable National Income (DNI). If DNI is not perfectly diversified consumption can be smoothed through pro-cyclical saving behavior. Individuals save and dis-save in order to smooth consumption intertemporally. If DNI is highly persistent, individuals may—if their behavior is guided by permanent income considerations—optimally choose to engage in very little consumption smoothing through saving although patterns of life-cycle saving may or may not help smooth consumption. If fluctuations in DNI are transitory, individuals will optimally choose to engage in much consumption smoothing through saving.¹⁵

The variance decomposition described below allows us to measure the fraction of shocks to GDP that are smoothed through international factor income flows, through international transfers, through saving, and the fraction of shocks that are not smoothed.

4.2 Decomposing the cross-sectional variance of shocks to GDP

Consider the identity, holding for any period t ,

$$\text{GDP}^i = \frac{\text{GDP}^i}{\text{GNI}^i} \frac{\text{GNI}^i}{\text{NI}^i} \frac{\text{NI}^i}{\text{DNI}^i} \frac{\text{DNI}^i}{\text{C}^i + \text{G}^i} (\text{C}^i + \text{G}^i), \quad (2)$$

where all the magnitudes are in per capita terms, and i is an index of countries. To stress the cross-sectional nature of our derivation, we suppress the time index.

Taking logs and differences on both sides of (2), multiply both sides by $\Delta \log \text{GDP}^i$ (minus

¹⁵Baxter and Crucini's (1995) showed that when shocks to GDP are transitory, borrowing and lending in the credit market is a close substitute for income insurance. In contrast, if shocks to GDP are highly persistent, the credit market will not closely mimic the role of capital markets, i.e., shocks that were not insured ex-ante on capital markets will not be smoothed ex-post on credit markets.

its mean) and taking the cross-sectional average, we obtain the variance decomposition

$$\begin{aligned}
\text{var}\{\Delta \log \text{GDP}^i\} &= \text{cov}\{\Delta \log \text{GDP}^i - \Delta \log \text{GNI}^i, \Delta \log \text{GDP}^i\} \\
&+ \text{cov}\{\Delta \log \text{GNI}^i - \Delta \log \text{NI}^i, \Delta \log \text{GDP}^i\} \\
&+ \text{cov}\{\Delta \log \text{NI}^i - \Delta \log \text{DNI}^i, \Delta \log \text{GDP}^i\} \\
&+ \text{cov}\{\Delta \log \text{DNI}^i - \Delta \log(\text{C}^i + \text{G}^i), \Delta \log \text{GDP}^i\} \\
&+ \text{cov}\{\Delta \log(\text{C}^i + \text{G}^i), \Delta \log \text{GDP}^i\} .
\end{aligned}$$

In this equation “var { X }” and “cov { X,Y }” denote the statistics $\frac{1}{N} \sum_{i=1}^N (X^i - \bar{X})^2$ and $\frac{1}{N} \sum_{i=1}^N (X^i - \bar{X})(Y^i - \bar{Y})$, respectively, where N is the number of countries in the sample. Dividing by $\text{var}\{\Delta \log \text{GDP}^i\}$ we get $1 = \beta_f + \beta_d + \beta_\tau + \beta_s + \beta_u$, where, for example,

$$\beta_f = \frac{\text{cov}\{\Delta \log \text{GDP}^i - \Delta \log \text{GNI}^i, \Delta \log \text{GDP}^i\}}{\text{var}\{\Delta \log \text{GDP}^i\}} \quad (3)$$

is the ordinary least squares estimate of the slope in the cross-sectional regression of $\Delta \log \text{GDP}^i - \Delta \log \text{GNI}^i$ on $\Delta \log \text{GDP}^i$, and similarly for β_d , β_τ , and β_s . The last coefficient in the decomposition is given by:

$$\beta_u = \frac{\text{cov}\{\Delta \log(\text{C}^i + \text{G}^i), \Delta \log \text{GDP}^i\}}{\text{var}\{\Delta \log \text{GDP}^i\}}, \quad (4)$$

which is the ordinary least squares estimate of the slope in the cross-sectional regression $\Delta \log(\text{C}^i + \text{G}^i)$ on $\Delta \log \text{GDP}^i$.

If there is full risk sharing, then $\text{cov}\{\Delta \log(\text{C}^i + \text{G}^i), \Delta \log \text{GDP}^i\} = 0$, and hence $\beta_u = 0$. If full risk sharing is not achieved, then consumption in country i varies positively with idiosyncratic shocks to country i 's output, and $\beta_u > 0$. A cross-sectional regression of consumption on output, controlling for fluctuations in world consumption is, therefore, a test of full risk sharing.¹⁶

If full risk sharing is achieved through income insurance via factor income flows, then

¹⁶This is the test suggested by Mace (1991) and Townsend (1994) who test for full risk sharing by running cross-sectional (or panel) regressions of consumption on income, controlling for aggregate movements in income and consumption. Cochrane's (1991) test is very similar.

$\text{cov}\{\Delta \log \text{GNI}^i, \Delta \log \text{GDP}^i\} = 0$ and hence, $\text{cov}\{\Delta \log \text{GDP}^i - \Delta \log \text{GNI}^i, \Delta \log \text{GDP}^i\} = \text{var}\{\Delta \log \text{GDP}^i\}$, implying $\beta_f = 1$. Moreover, in this case, since consumers in each country consume their GNI, namely, $c^i = \text{GNI}^i$, implying that $\beta_u = 0$.¹⁷

Suppose that full risk sharing is not achieved through income insurance via factor income flows and capital depreciation, but is achieved through the combination of factor income flows, depreciation, and international transfers. Then by analogous reasoning, $\beta_f + \beta_d + \beta_\tau = 1$, and since consumers in each country will consume their DNI, $\beta_u = 0$. Similarly, if the full risk sharing allocation is achieved through factor income flows, depreciation, international transfers, and saving, Then, by analogous reasoning, $\beta_f + \beta_d + \beta_\tau + \beta_s = 1$ and $\beta_u = 0$.

β_u is the fraction of shocks to GDP that is not smoothed. The coefficients β_f , β_d , β_τ , and β_s are interpreted as the fraction of shocks absorbed through factor income flows, depreciation, international transfers, and saving, respectively. If consumption is perfectly smoothed, they sum to unity and $\beta_u = 0$. If not, they sum to less than unity. In either case, they reflect the incremental amount of smoothing achieved through the various channels discussed above.

We not impose any restrictions on the sign of the β -coefficients. If a country that is hit by a positive shock has a smaller share of GDP allocated to, e.g., capital consumption, then depreciation provides cross-sectional dis-smoothing. Similarly, if taxes increase or decrease less than proportionately with output, they provide dis-smoothing.

5 Estimation

5.1 Estimating channels of risk sharing

At the practical level, the following (panel) equations are estimated:

$$\begin{aligned} \Delta \log \text{GDP}_t^i - \Delta \log \text{GNI}_t^i &= \nu_{f,t} + \beta_f \Delta \log \text{GDP}_t^i + \epsilon_{f,t}^i, \\ \Delta \log \text{GNI}_t^i - \Delta \log \text{NI}_t^i &= \nu_{d,t} + \beta_d \Delta \log \text{GDP}_t^i + \epsilon_{d,t}^i, \\ \Delta \log \text{NI}_t^i - \Delta \log \text{DNI}_t^i &= \nu_{\tau,t} + \beta_\tau \Delta \log \text{GDP}_t^i + \epsilon_{\tau,t}^i, \end{aligned} \tag{5}$$

¹⁷If full risk sharing is not achieved through income insurance via factor income flows, then $\text{cov}\{\Delta \log \text{GNI}^i, \Delta \log \text{GDP}^i\} > 0$ and hence, $\text{cov}\{\Delta \log \text{GDP}^i - \Delta \log \text{GNI}^i, \Delta \log \text{GDP}^i\} < \text{var}\{\Delta \log \text{GDP}^i\}$, implying $\beta_f < 1$.

$$\begin{aligned}\Delta \log \text{DNI}_t^i - \Delta \log(C_t^i + G_t^i) &= \nu_{s,t} + \beta_s \Delta \log \text{GDP}_t^i + \epsilon_{s,t}^i, \\ \Delta \log(C_t^i + G_t^i) &= \nu_{u,t} + \beta_u \Delta \log \text{GDP}_t^i + \epsilon_{u,t}^i,\end{aligned}$$

where $\nu_{s,t}$ are time fixed effects. The time fixed effects capture year specific impacts on growth rates, most notably the impact of the growth in aggregate output. Furthermore, with time fixed effects the β -coefficients are weighted averages of the year-by-year cross-sectional regressions. To take into account autocorrelation in the residuals we assume that the error terms in each equation and in each country follow an AR(1) process. Since the samples are short, we assume that the autocorrelation parameter is identical across countries and equations. We further allow for state specific variances of the error terms. In practice, we estimate the system in (5) by a two step Generalized Least Squares (GLS) procedure. Unless we say otherwise, we use differenced data at the yearly frequency, although we will also show results for longer differencing intervals. Because our method is based on panel estimations with time fixed effects, it yields fully consistent estimates even if there are worldwide taste shocks.

5.2 Income insurance and consumption smoothing among Pacific Island countries

Table 3 displays the estimated percentages of GDP-shocks smoothed through each channel for PIC. In order to compare the magnitudes of the channels of risk sharing, we estimate the channels of income and consumption smoothing for OECD members in Table 4. Conceptually, the coefficients add up to 100 percent but we choose not to impose this constraint. The first rows in both the upper and lower panels correspond to the contribution of cross-country factor income flows to cross-country risk sharing, for PIC with and without A&NZ, respectively. In the lower panel, factor income flows have a positive and significant contribution(6 to 7 percent) to risk sharing. For PIC members, excluding A &NZ, the level of the cross border asset holdings-also cross-border financial asset income-is relatively lower compared to developed countries. However, the income from non-resident(seasonal)laborers working abroad is the driven factor behind the positive and significant level of factor income

smoothing.¹⁸ Unlike OECD members or A & NZ, net compensation of employees from rest of the world has a significant contribution to the PIC economies. According to the UN National Accounts Detailed Aggregates Database for the years between 1980-2006, Fiji, on average, had an inflow of compensation of employees from the rest of the world, of 2-3% of its GDP. Similarly, Kiribati had 3% , Papua New Guinea 3%, Tonga 2% and Vanuatu had 2%. These amounts are highly remarkable compared to A & NZ, where the net compensation of employees from the rest of the world was only 0.3% and 0.4% of their GDP, respectively. For OECD members, the smoothing via factor income was very limited until the 2000s. However due to the substantial decline in portfolio home bias the income from foreign assets is now able to smooth a portion of the domestic output shocks. Therefore the coefficient is positive and significant (6 percent) for recent years only.¹⁹ Additionally, net compensation of employees from the rest of the world is not an effective channel for other OECD members as well. To sum up, for both regions, smoothing via net factor income channel is significant but the sub-channels behind are different. For PIC, net income from seasonal (and short term) foreign income is the driven factor whereas for OECD members, net income from foreign assets is the main factor for the significant net factor income flows.

It is very hard to interpret the depreciation channel in explaining the channels of income smoothing. This variable isn't very interesting because depreciation is a function of past investment and, besides, is mainly imputed. However, the negative sign can be relatively more intuitive since when output goes up, depreciation typically doesn't move with output and therefore a larger share of output is available for income and consumption. For OECD members, we documented negative signs for depreciation in Table 4. However, for PIC members without A&NZ, it is highly volatile in every decade. We may consider that ongoing massive construction works taking place in the urban areas and the destruction of old buildings in sake of having newer buildings might be the reason for higher volatility in this channel.

The third rows in Table 3 contains the coefficients of income smoothing via transfers.

¹⁸The difference between GDP and GNP, the net factor income, is roughly decomposed of net income from net financial assets (equity, bond and FDI earnings) , net compensation of employees from the rest of the world and net tax on imports.

¹⁹Sorensen et al.(2007) and Balli and Sorensen(2007) found that the capital market integration among high income OECD members allowed significant magnitudes of income smoothing via net factor income.

Transfers include official transfers, such as contributions to foreign aid, and workers' remittances which, on average are expected to be positive and significant for PIC without A&NZ. Compared to the OECD members, where the coefficient is not significant, it is significant for PIC members. In average years between 1981 and 2006, around 9 % of output shocks has been buffered by international transfers. That amount is 0 % for OECD members. Additionally, in the paper, we go one step further in the next chapter and decompose this channel by measuring the sole effect of the remittance transfers and financial aid.

The fourth rows in Table 3 contains the coefficients of income smoothing via savings. In both panels the bulk of consumption smoothing is achieved via savings. However, in the upper panel we observe that the savings channel is higher in magnitude than it is in the lower panel. In considering the effect of A&NZ, which have better credit markets, the residents of A&NZ are more open to using the credit markets for buffering the output shocks, whereas the rest of the PIC countries do not have that advantage. We have observed higher magnitudes for saving channel for OECD countries. The overall smoothing via savings is around 60 % for OECD members whereas it is around 25% for PIC without A&NZ and 39% for PIC with A&NZ.

Overall, for PIC, the income smoothing is dominated by the savings channel, however, unlike the OECD sample, the smoothing via factor income and international transfers are also in significant magnitude. Relatively higher amounts of remittance transfers (and compensation of employees from abroad) from immigrants and financial aid inflows to the poor regions of PIC are the main reasons why these channels are working more effectively than they do for OECD members.

6 Income Smoothing Via Net Remittance Flows and Foreign Aid

There has been a vast literature emphasizing the effects of financial aid and remittance transfers on economic growth for Pacific Island region, including Knapman (1986) Gounder (2001) Jayaraman (2006), Choong (2006), Pavlov et al.(2006) Rao and Takuria (2006) Rao et al. (2007). However, the literature is quite silent about measuring the extent to which

remittances and financial aid buffer domestic output shocks and stabilize the consumption per capita.²⁰ Considering PIC (without A&NZ) where they are still growing and real GDP per capita is behind A&NZ, both transfers through non-immigrants and immigrants living abroad and financial aid from international institutions and governments might be effective channels to buffer the domestic shocks. To shed a light on the amount of remittances in the region, Ratha et al. (2009) documents that the remittance inflows(both remittance inflows and compensation of employees) to PIC (without A&NZ) was around 2 billion USD in 2008. Remittances are injecting a remarkable amount into those economies. For instance, in 2008, Tonga had a remittance inflow as 37 of its GDP%, Samoa has 26%. Even; in the bigger economies, i.e. Fiji and Papua New Guinea the ratios are 7 % and 3%. Comparing those numbers with A&NZ, Australia had an injection of remittances only 0.4 % of its GDP whereas New Zealand had 0.5%.²¹

Again according to World development Indicators(WDI), the financial aid flows are also in remarkable amounts to the region countries. Between the years 1980-2007, Fiji had a financial aid inflow as 3 of its GDP% on average, Papua New Guinea had 10 %. For smaller economies, the ratio is much higher. For Kiribati it is 50%, for Palau 47% Samoa 21%, Tonga 20% and Vanuatu 17%. Overall, both remittances and financial aid are highly important for the PIC's economies and they can not disregard the importance of these channels in smoothing the domestic output shocks. In this section, we measure the extent of shocks smoothed by remittances and financial aid separately.

Remittances smooth domestic output shock when remittances and domestic economy move acyclically. In other words, the remittances are able to share domestic shocks when migrants send more money back home when the domestic economy is in recession and vice-versa. In this regard, the main motivation of smoothing via remittance inflows might be the strong family ties between migrants and their families back in the home country and the altruism of going along with national views. For example, migrants expect to send more back to home when an economy is recession as his/her relatives need more inflows than the

²⁰However, there are not many papers focusing on the insurance role of the remittances for domestic output shocks. With a limited country dataset, Sayan (2006) studied whether or not remittances have a tendency to move counter-cyclically with the GDP in recipient countries.

²¹In average, for high income OECD countries it is 0.2 % for 2008.

economy is boom and vice-versa.

In order to measure income smoothing via net remittance flows, we estimate the following equation;

$$\Delta \log \text{GDP}_t^i - \Delta \log(\text{GDP}_t^i + \text{NET_REMITTANCES}_t^i) = \nu_{k,t} + \beta_{rem} \Delta \log \text{GDP}_t^i + \epsilon_{i,t} \quad , \quad (6)$$

where “(Net Remits) $_t^i$ ” is the year t Net remittance flows for country i at time t . $\nu_{k,t}$ is a time fixed effect. As we noted earlier, the time fixed effects capture year-specific impacts on growth rates, most notably the impact of the growth in aggregate output. The regression examines if output plus net remittance inflows (which can be considered as “income” available before other channels of risk sharing) varies less than one-to-one with output. If that is the case, there is positive risk sharing from net remittance flows. The estimated coefficient β_{rem} is our measure of such risk sharing via remittance inflows.

Similarly, we obtain income smoothing via financial aids from the rest of the world with the following equation;

$$\Delta \log \text{GDP}_t^i - \Delta \log(\text{GDP}_t^i + \text{FINANCIAL_AID}_t^i) = \nu_{k,t} + \beta_{aid} \Delta \log \text{GDP}_t^i + \epsilon_{i,t} \quad , \quad (7)$$

where “FINANCIAL AID $_t^i$ ” is Financial Aid from abroad for country i at time t . $\nu_{k,t}$ is a time fixed effect. Similarly, the regression examines if output plus financial aid (which can be considered as “income” available before other channels of risk sharing) varies less than one-to-one with output.

Table 5 displays income smoothing from net remittance inflows(upper panel) and financial aid from other governments and financial institutions(lower panel). The last columns contain the regression condiments for the entire sample. We observe that for the entire period, financial aid channel smooths the domestic output shock to some extent whereas income smoothing via remittances is neither positive nor significant. By looking at sub-samples, we realize that smoothing via remittances is highly volatile. Between 1987 and 1999, income smoothing via remittance flows is negative and significant, whereas the table indicates that, from 2000 onwards, 29 percent of domestic shocks were absorbed by the

remittances. On the other hand, for financial aid, the entire sample results demonstrate that financial aid is very effective for buffering the domestic output risk in PIC . It is 12 percent and significant. Even though smoothing via financial aid is higher and of significant levels in magnitude before 2000, we also observe that channel of smoothing via financial aid decreased in magnitude in the recent years.

In Figure 1 we illustrate the results discussed so far in graphical form. The pink line corresponds to the income smoothing via remittances and the blue line corresponds to smoothing via financial aid. We observe that smoothing via remittances are highly volatile for the given periods. There is a negative smoothing before 2000 and after 2000, there is positive and significant level of smoothing. Compared to remittances, smoothing via financial aid is less volatile, even though there is a decline in the amount of smoothing in recent years. Overall, both remittances and financial aid are the main components of channel of international transfers. We observe from the figure that adding both remittance and financial aid channels(the yellow line), there exists positive income smoothing via both remittances and financial aid for PIC.

7 Concluding Remarks

In this paper, we examine the potential welfare gains and channels of income smoothing for 14 PIC. We find that the overall welfare gains across all PIC (in particular Kiribati, Palau and Papua New Guinea) are higher than the potential gains for OECD countries, under the full risk risk-sharing. For the developed portion of the PIC, New Zealand is to have a remarkable welfare gain from full risk sharing with PIC, compared to the potential welfare gains when New Zealand attains full risk sharing with other OECD members. However, for Australia, the potential welfare gains from full risk sharing are almost similar to the gains it obtains when Australia attains full risk sharing with the rest of the OECD countries or with New Zealand alone. Given that Australia is the strongest(both economically and demographically) country in the region and the motivation of Australia for achieving full risk sharing is not as high as other countries in the region, the possibility of attaining full risk sharing does not seem plausible in the near future.

In quantifying the extent and channels of risk sharing across the PIC, we find that, for these countries, income smoothing channels are buffering (in particular, current transfers and net factor income) a non negligible part of the domestic output shock, compared to the power of those channels on income smoothing for OECD members. We indicate that the net factor income channel is driven by the net compensation of employees from the rest of the world. For OECD members, recently observed significant smoothing via net factor income is driven by the income from the foreign financial asset incomes(decline in portfolio home bias across OECD members). Domestic savings also smooth a fair portion of shocks to output, but the extent is much lower compared to the effect of the saving channel on income smoothing for OECD countries. Further, we analyze the effect of remittances and financial aid on income smoothing for the less developed portion of PIC. We find that, smoothing via remittances is volatile and only significant in recent years,whereas financial aid seems a more stable and a stronger channel to smooth the domestic output shocks for PIC.

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Table 1: **Descriptive Statistics for Pacific Island Countries.**

	(1)	(2)	(3)	(4)	(5)	(6)
	GDP		Consumption		GDP	Cons.
	Mean	St.dev.	Mean	St.dev.	Correlations	
Australia	0.77	3.77	0.79	3.83	0.99	0.99
Fiji	0.31	4.80	1.29	7.69	0.80	0.78
French Poly.	0.79	4.05	2.28	5.48	0.64	0.51
Kiribati	0.41	6.02	1.28	7.13	0.71	0.70
Marshall Isl.	0.05	1.97	-0.08	2.24	0.46	0.42
Micronesia	0.31	1.55	0.15	1.55	0.27	0.19
New Caledonia	0.48	4.24	0.84	5.21	0.69	0.55
New Zealand	1.20	5.19	1.22	5.24	0.94	0.91
Palau	0.20	6.02	-0.17	10.60	0.67	0.41
Papua N.G.	-0.35	6.86	-0.11	7.56	0.76	0.71
Samoa	0.28	3.13	0.52	5.04	0.84	0.53
Solomon Isl.	-0.21	4.47	0.11	5.26	0.63	0.79
Tonga	0.24	3.22	0.43	4.57	0.86	0.58
Vanuatu	0.95	3.45	1.04	4.12	0.76	0.79
Average	0.36	3.84	0.85	5.40	0.72	0.62
Average w/o A&NZ	0.26	3.71	0.83	5.45	0.67	0.56

Notes. Correlations are calculated with respect to the 14-country aggregate. Means and standard deviations are multiplied by 100.

Table 2: **Standard Deviation of GDP growth, correlation with Aggregate GDP growth and potential welfare gains from Risk Sharing among Pacific Island countries.**

	Correlation	Welfare Gains
Australia	0.99	0.51
Fiji	0.80	4.32
French Polynesia	0.64	7.94
Kirbati	0.71	11.22
Marshall Islands	0.46	5.69
Micronesia	0.27	5.82
New Caledonia	0.69	8.95
New Zealand	0.94	1.31
Palau	0.67	13.02
Papau New Guinea	0.76	5.37
Samoa	0.84	4.05
Solomon Islands	0.63	5.48
Tongo	0.86	2.60
Vanuatu	0.76	6.14

Notes. Sample:1981:2007. The Gain column represent the welfare gain in utility, when each country moves from financial autarky(each member consumes its GDP) to perfect risk sharing(where the consumption growth does not depend on the GDP growth). The gain can be interpreted as a permanent percentage increase in the country's per capita consumption relative to its initial consumption autarky.

Table 3: **Income and Consumption Smoothing (percent) by National Accounts Categories.**

PIC with A&NZ.				
	1981–1990	1991–2000	1991-2006	1981–2006
Factor Income (β_f)	0 (2)	5 (6)	1 (7)	4 (2)
Depreciation (β_d)	-7 (2)	1 (4)	0 (6)	-1 (4)
Transfers (β_τ)	-2 (3)	-4 (3)	3 (2)	3 (1)
Saving (β_s)	28 (12)	48 (12)	32 (11)	39 (10)
Not Smoothed (β_u)	80 (11)	52 (17)	64 (18)	58 (12)

PIC without A&NZ.				
	1981–1990	1991–2000	1991-2006	1981–2006
Factor Income (β_f)	7 (3)	7 (4)	7 (2)	6 (4)
Depreciation (β_d)	-12 (1)	8 (8)	9 (8)	-1 (6)
Transfers (β_τ)	9 (3)	8 (4)	10 (3)	9 (3)
Saving (β_s)	23 (13)	18 (11)	31 (14)	25 (10)
Not Smoothed (β_u)	73 (14)	59 (18)	47 (12)	61 (19)

Notes. PIC: Australia, Fiji, Papua New Guinea, New Zealand, Samoa, Tonga and Vanuatu. Percentages of shocks absorbed at each level of smoothing. Standard errors are in brackets. β_f is the GLS estimate of the slope in the regression of $\Delta \log \text{GDP}^i - \Delta \log \text{GNI}^i$ on $\Delta \log \text{GDP}^i$, β_d is the slope in the regression of $\Delta \log \text{GNI}^i - \Delta \log \text{NI}^i$ on $\Delta \log \text{GDP}^i$, and similarly for β_τ and β_s . β_u is the coefficient in the regression of $\Delta \log(\text{C}^i + \text{G}^i)$ on $\Delta \log \text{GDP}^i$. We interpret the β -coefficients as the incremental percentage amounts of smoothing achieved at each level, and β_u is the percentage of shocks not smoothed.

Table 4: **Income and Consumption Smoothing (percent) by National Accounts Categories for OECD Members.**

	<u>1971–1980</u>	<u>1981–1990</u>	<u>1991–2000</u>	<u>2001–2007</u>	<u>1971–2007</u>
Factor Income (β_f)	0 (1)	-1 (1)	0 (1)	6 (3)	0 (1)
Depreciation (β_d)	-6 (1)	-9 (1)	-11 (1)	-7 (1)	-8 (1)
Transfers (β_τ)	-1 (1)	1 (1)	1 (1)	1 (1)	0 (1)
Saving (β_s)	58 (4)	56 (4)	58 (5)	64 (7)	59 (2)
Not Smoothed (β_u)	47 (4)	45 (2)	48 (3)	33 (4)	44 (2)

OECD: Australia, Canada, Japan, New Zealand, Norway, Switzerland, the U.S., Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Spain, Portugal, Sweden, and UK. Percentages of shocks absorbed at each level of smoothing. Standard errors in brackets. β_f is the GLS estimate of the slope in the regression of $\Delta \log \text{GDP}^i - \Delta \log \text{GNI}^i$ on $\Delta \log \text{GDP}^i$, β_d is the slope in the regression of $\Delta \log \text{GNI}^i - \Delta \log \text{NI}^i$ on $\Delta \log \text{GDP}^i$, and similarly for β_τ and β_s . β_u is the coefficient in the regression of $\Delta \log(c^i + g^i)$ on $\Delta \log \text{GDP}^i$. We interpret the β -coefficients as the incremental percentage amounts of smoothing achieved at each level, and β_u is the percentage of shocks not smoothed.

Table 5: **Decomposition of International Income Smoothing Channel: Income Smoothing Via Remittance Transfers and Financial Aid.**

Net Remittance Transfers from Immigrants				
	1987-1999	2000-2009	1989-2009	
NET REMITTANCES	-15	29	-1	
	(5)	(10)	(4)	

Financial Aid				
	1983-1990	1991-1999	2000-2007	1983-2007
FINANCIAL AID	17	20	2	12
	(8)	(7)	(2)	(5)

PIC: Fiji, Kiribati, New Caledonia, Papua New Guinea, Samoa, Solomon Islands Tonga, and Vanuatu. Percentages of shocks absorbed at each level of smoothing. Standard errors are in brackets. Income Smoothing through net Remittance Transfers from Immigrants is calculated by estimating GLS estimate of the slope in the regression of $\Delta \log \text{GDP}^i - \Delta \log(\text{GDP} + \text{NET REMITTANCES})^i$ on $\Delta \log \text{GDP}^i$. Income smoothing through financial aid inflows from international institutions or other governments is calculated by estimating $\Delta \log \text{GDP}^i - \Delta \log(\text{GDP} + \text{FINANCIAL AID})^i$ on $\Delta \log \text{GDP}^i$.

Figure 1: Income Smoothing Via Financial Aid and Net Remittances for PIC without A&NZ

