Financial Liberalization and Consumption Volatility in Developing Countries

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Abstract

One of the chief benefits of financial liberalization proposed by theoretical literature is that it should allow countries to better smooth consumption through international risk sharing. Recent empirical evidence does not support this prediction. In developing countries, financial liberalization seems to be associated with an increase in consumption volatility. This paper seeks to rationalize the evidence by linking it to two important features of developing countries. First, domestic financial markets are underdeveloped. We model this by adopting the Kocherlakota (1996) framework of risk sharing subject to limited commitment. Second, access to international markets is not available to all members of society. We show that when risks are idiosyncratic, that is, insurable within the domestic economy, opening up to international markets reduces the amount of risk sharing attained at home and raises the volatility of consumption. When risk is aggregate to the economy, the underdeveloped financial system prevents the pooling of aggregate risk across agents for the purposes of insurance in the international markets. Thus, while the volatility of consumption coming from aggregate risk decreases with financial liberalization, it does so by much less than would be predicted by a representative agent model.

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1 Introduction

How does international financial integration help developing countries? Two main potential benefits are the more efficient allocation of capital across country borders, and improved risk sharing opportunities. For risk sharing in particular, international financial integration should lead to a decrease in consumption volatility relative to output volatility. The last few decades indeed saw ever-increasing capital flows across national borders. What did we learn about the effects of international financial integration on the volatility of consumption?

The latest empirical evidence suggests that the outcomes are quite different from those predicted by the conventional risk sharing models. Kose, Prasad and Terrones (2003) examine the volatility of consumption relative to income for a broad sample of developing countries. The results are quite puzzling. Consumption volatility relative to income volatility has actually increased between the 80's and the 90's for the more financially integrated developing countries. The period in question is precisely the time of increased cross-border capital flows that should have afforded those countries an opportunity to smooth consumption in the face of income shocks. The authors point out that these results cannot be explained away by some countries experiencing crises, because they look at consumption volatility relative to that of income. The regression analysis corroborates these results. Financial openness, measured by the gross capital flows relative to GDP, is associated with an *increase* in the ratio of consumption volatility to income volatility, up to a certain level of financial openness. Beyond that level, financial integration does seem to lower consumption volatility.

The main purpose of this paper is to explore an explanation for the perplexing empirical evidence. We study the effects of financial liberalization on developing countries in light of two important features of these countries. First, domestic institutions and financial markets are underdeveloped. Second, not all agents have access to the international financial markets. In this framework, we reach three main results. When risks are purely idiosyncratic, that is, perfectly insurable within the domestic economy, opening up to international markets reduces the amount of risk sharing attained at home and raises the volatility of consumption. When risk is purely aggregate to the economy, the underdeveloped financial system prevents the pooling of aggregate risk across agents for the purposes of insurance in the international markets. Thus, while the volatility of consumption decreases with opening in this case, it does so by much less than in a frictionless model. Finally, the gains from financial integration are unevenly distributed. Agents that have direct access to international markets benefit disproportionately, while those that do not may actually experience an increase in their consumption volatility and a decline in welfare.

This paper represents a very different treatment of the relationship between financial integration and consumption volatility. In thinking about this relationship, our intuitions are typically shaped by representative agent models such as Obstfeld (1994) or Obstfeld and Rogoff (2000). By construction, these models can only tell us about the role of financial integration in sharing aggregate country risk. The representative agent models make two implicit assumptions. First, to the extent there is idiosyncratic risk among agents within a country, these agents reach the first best level of risk sharing, and only aggregate risk remains to be insured abroad. Second, the aggregate country risk is perfectly pooled across agents, or, alternatively, all agents have equal access to the international markets.

To help rationalize the disconcerting empirical evidence, this paper focuses on precisely the aspects missing from the traditional analysis. We move away from the representative agent framework. In our model, agents are heterogeneous both in their income process, and in whether or not they have access to the international financial markets. Of course, this approach is only fruitful when the within-country risk sharing arrangement is subject to frictions, but we believe that these frictions are important, especially in the less developed countries. Indeed, the hypothesis of complete consumption risk sharing is typically rejected even in economies with highly sophisticated financial markets such as the US (Attanasio and Davis, 1996, Hayashi, Antonji, and Kotlikoff, 1996). In developing countries with poor quality of contracting institutions, obstacles to sharing idiosyncratic consumption risks are bound to be even more severe.

The basic model is a version of the Kocherlakota (1996), or Kehoe and Levine (2001) framework of risk sharing subject to limited commitment. In the model there are two groups of people whose income processes may differ. They enter into a risk sharing relationship, subject to the constraint that participation by each agent must be voluntary in all dates and states. We view this constraint as a consequence of poor contract enforcement and an underdeveloped financial system. Agents cannot successfully commit their future income flows to the risk sharing relationship.

The voluntary participation constraint means that the first best level of risk sharing is not necessarily achieved. Agents with high current income realizations will be tempted to walk away from the risk sharing arrangement and enjoy the high current consumption. If the agent does walk away, however, the risk sharing arrangement is severed forever. Naturally, each agent's outside option will be key in determining the extent to which voluntary participation is sustainable. If the outside option is very good, the risk sharing relationship may not be viable, because the agent will choose to walk away the first time her current income shock is high. Since financial opening will affect some agents' outside option, it will have an important effect on the state of domestic risk sharing.

We model financial opening as allowing only one group of agents access to international markets. We call these agents the upper, or middle, class. The assumption that only some groups will have access to foreign markets seems plausible for developing countries. For simplicity, we will think of the foreign markets as providing an exogenous amount of insurance, and do not model them explicitly. When the upper class gains access to the international markets, it chooses the amount of its participation in the domestic and foreign markets optimally. Thus, we extend the basic Kocherlakota framework to endogenize the extent of participation in the domestic risk sharing arrangement by one of the groups.

What effects will financial liberalization have in this economy? We consider two polar cases. First, suppose that the groups face purely idiosyncratic risks, and aggregate country risk is absent. In the frictionless benchmark, there is no insurance role for the international markets. When domestic risk sharing is subject to frictions, however, access to international markets has important consequences through its effect on agents' outside options. As the upper class experiences a dramatic increase in their outside option, the extent of risk sharing attainable in the domestic relationship is reduced. Furthermore, the less attractive the domestic risk sharing relationship becomes, the more likely it is that the upper class will reduce its participation in it, and insure abroad instead. When they do so, the agents left behind in the domestic risk sharing relationship experience an increase in consumption volatility, because the income from the upper class is no longer available to insure them. Thus, when access to international financial markets is quite uneven in the economy, some groups' participation in these markets actually lowers the extent of risk sharing available at home. As a result, the members of society unable to take advantage of international financial integration will be adversely affected, and their consumption volatility will increase. It is important to note that in this model, agents use international markets to insure idiosyncratic risks, that is, risks that are in principle insurable within the domestic economy. This possibility has not, to our knowledge, been considered in the literature so far.

The second polar case we consider is that of only aggregate uncertainty. All agents in the economy face the same income process, but they are nonetheless heterogeneous in whether or not they have access to international markets. In the frictionless benchmark, it is not important which of the agents have access to international markets, because the aggregate income risk would be pooled and insured abroad optimally by the agents able to do so. In our framework, the voluntary participation constraint in the domestic markets prevents this from occurring. The upper class will certainly insure its income shocks abroad. However, there are limits to how much of the lower class's income it can insure. We show that in this framework, even aggregate country risk may not be fully eliminated.

It is also clear that the benefits from financial integration are unevenly distributed between the groups, with the upper class enjoying them fully, while the lower class benefits less. Furthermore, when idiosyncratic risks predominate in the economy, agents that do not have access to international markets may actually lose from financial liberalization, as their opportunities for insuring income risk decrease.

A large literature studies the relationship between financial and trade integration and output volatility. Since integration affects agents' investment and asset allocation decisions, it naturally changes the volatility of output. A number of very different models, such as Baxter and Crucini (1995), and Acemoglu and Zilibotti (1997) show that output volatility may increase due to financial integration. An important strand of the literature analyzes the role of speculative capital flows in precipitating financial crises in emerging markets, with important consequences for real output volatility. Kaminsky and Reinhart (1999) argue that emerging market crises are frequently "twin crises," in which a balance of payments crisis is combined with a banking crisis. In this framework, foreign capital inflows prone to "sudden stops" a la Calvo (1998) exacerbate distortions in the domestic banking system and increase the likelihood of crises.

This paper addresses a different question. Suppose that international financial integration does increase output volatility in emerging markets – though, perhaps surprisingly, this does not appear to be the case (see Kose, Prasad and Terrones, 2003). A representative agent model in which agents can use international markets to insure against output risk would still imply that consumption volatility, and certainly the ratio of consumption volatility to income volatility, should decline under quite general conditions.[1] Here, we provide a framework which shows that domestic frictions and uneven access to international markets can prevent this from happening, and indeed consumption volatility can increase with financial liberalization in some cases. The argument does not rely on a rise in output volatility resulting from liberalization.

The contribution most closely related to ours is Attanasio and Rios-Rull (2000b). These authors build a model of a village economy in which agents face both aggregate and idiosyn-

[1] An important exception is an economy which is subject primarily to shocks to trend growth. See Aguiar and Gopinath (2004)

cratic risks. Local arrangements subject to limited commitment help agents partly insure against idiosyncratic risks. The authors consider the consequences of an outside program that insures the villagers against the aggregate risk. They find that because aggregate insurance raises the agents' outside option, arrangements to share idiosyncratic risks deteriorate. The authors use this framework to caution against undesirable consequences of international aid programs to poor village economies in less developed countries. While the model in our paper is methodologically related to this contribution, we address a different issue, and suggest a different mechanism. In our model, agents use international markets to smooth both idiosyncratic and aggregate income shocks. Consumption volatility increases because of uneven access to foreign markets, and is related explicitly to participation in international financial markets. The framework we use thus allows us address the distributional aspects of financial integration in developing countries. In addition, the Attanasio and Rios-Rull mechanism does not generate an increase in aggregate consumption volatility that can be obtained in our model.

The limited commitment framework has been applied in international macroeconomics to study risk sharing (see Kehoe and Perri, 2002, for a state of the art example). An important difference between this paper and existing literature is that limited commitment is typically employed to model risk sharing between countries. This paper analyzes a case in which the limited commitment friction affects agents within a country, and the presence of international markets affects purely domestic risk sharing relationships.

The rest of the paper is organized as follows. Section 2 presents a sketch of the argument for how incomplete participation in international markets can increase consumption volatility if risks are not shared efficiently within the economy. Agents' behavior looks clearly suboptimal in this example. Section 3 presents the model of risk sharing, in which the perverse effects sketched out in the simple example arise as a consequence of frictions in the domestic risk sharing system, namely limited commitment. In particular, we analyze the cases of purely idiosyncratic risk and purely aggregate risk, to show that domestic frictions can prevent this economy from taking full advantage of international consumption insurance opportunities and, in some cases, aggregate consumption volatility can actually go up. Section 4 concludes.

2 An Example

Suppose there is an endowment economy populated by two types of agents, A and B. The agents' endowments in each period are comprised of an aggregate component common to both groups, and an idiosyncratic component, which is perfectly negatively correlated across groups. Suppose for simplicity that the aggregate shock takes on values of η and $-\eta$ with equal probability. Type A gets an idiosyncratic shock of size ω with probability $\frac{1}{2}$, and $-\omega$ with probability $\frac{1}{2}$, independent of the aggregate shock in that period. Type B's idiosyncratic shock is the opposite of A's in each case. There are then four equiprobable states of nature, for which agent endowments (e^A, e^B) are given in Table 1.

(e^A, e^B)		Aggregate State	
		High	Low
Idiosyncratic State	$s = 1$	$(1 + \eta + \omega, 1 + \eta - \omega)$	$(1 - \eta + \omega, 1 - \eta - \omega)$
	$s = 2$	$(1 + \eta - \omega, 1 + \eta + \omega)$	$(1 - \eta - \omega, 1 - \eta + \omega)$

Table 1: Agents' endowment values by state.

In this endowment economy with no aggregate saving, the variance of aggregate output is $Var(Y) = 4\eta^2$. In the closed economy, variance of aggregate consumption is $Var(C) = 4\eta^2$ as well. Assuming agents are perfectly able to share idiosyncratic risk, the average consumption variance across agents is $\overline{Var(c)} = \eta^2$.

Suppose now that this economy opens up to international markets, but not all agents have access. In particular, assume that only type A can insure abroad, and for simplicity suppose she insures perfectly her income process, both the aggregate and idiosyncratic components. Now A's consumption is constant, but none of B's risks are insured. Consumption values of agents (c^A, c^B) are given in Table 2.

(c^A, c^B)		Aggregate State	
		High	Low
Idiosyncratic State	$s = 1$	$(1, 1 + \eta - \omega)$	$(1, 1 - \eta - \omega)$
	$s = 2$	$(1, 1 + \eta + \omega)$	$(1, 1 - \eta + \omega)$

Table 2: Agents' consumption values by state, after opening.

While in this economy the variance of aggregate endowment is still $Var(Y) = 4\eta^2$, aggregate consumption now has variance $Var(C) = \eta^2 + \omega^2$. The average consumption variance across agents is $\overline{Var(c)} = \frac{1}{2}(\eta^2 + \omega^2)$.

Three conclusions from this simple example are worth highlighting. First, the volatility of aggregate consumption does not decrease unambiguously. It is true that type A's newfound ability to insure herself against aggregate risks acts to decrease consumption variance. But A's decision to participate in the foreign markets deprives type B of the ability to insure her idiosyncratic risks. Thus, if risks that are insurable within the economy are important relative to aggregate country risk, aggregate consumption volatility may go up as a result of type A's departure.

Second, the aggregate country risk is not eliminated entirely in this economy. While type A can insure herself against those risks, type B, which does not have access to international markets, is still subject to aggregate shocks. Thus, when access to international markets is uneven in this way, the economy may not be able to take full advantage of aggregate insurance they provide.

Finally, the gains from this type of liberalization are unevenly distributed. In particular, while A gains from accessing the international markets, B's consumption volatility increases due to reduced risk sharing opportunities at home.

This example is clearly trivialized. In particular, the agents' behavior following opening up to international markets looks far from optimal. Two key questions arise. First, why would type A insure her idiosyncratic risk abroad when she can do so at home? This question would be even more relevant, if, for example, accessing international markets is more costly than accessing domestic ones, an assumption made in the formal model in the next section. Second, why can't type A efficiently pool the entire aggregate risk of this economy, and use her access to foreign insurance technology to insure type B's aggregate risk as well? In a frictionless benchmark that we should keep in mind, agents insure each other perfectly against idiosyncratic risk before and after financial liberalization, and access to foreign insurance even by a subset of agents will eliminate all aggregate risk as well. In the next Section we build a model to show that frictions in the domestic risk sharing system lead to outcomes illustrated in this simple reduced-form example.

3 The Model

3.1 The Environment

The basic model is a simple version of Kocherlakota (1996), or Kehoe and Levine (2001). There is an endowment economy populated by two kinds of infinitely lived agents, A and B, with identical period utility $u(c)$, and discount rate $\beta < 1$. Each group has mass 1. Agents in each group maximize lifetime expected utility:

$$E_0 \sum_{t=0}^{\infty} \beta^t u(c_t) \tag{1}$$

There are S states of nature, denoted by $s = 1, ..., S$, with state s occurring with probability p_s. Agents' stochastic endowments are e_s^A and e_s^B in each $s = 1, ..., S$. We make the simplifying assumption that the two groups face an identical unconditional endowment process. Aggregate endowment in this economy is $Y_s = e_s^A + e_s^B$ in each state s.

We assume that endowments are perishable, and so there is no aggregate saving in the economy. When each agent simply consumes her endowment in every period, the lifetime expected utility is given by:

$$v_{aut} \equiv E\sum_{t=0}^{\infty}\beta^t u(e_t) = \frac{1}{1-\beta}\sum_{s=1}^{S} p_s u(e_s).$$

(Here, the subscript "*aut*" stands for personal "autarky.")

We model uneven access to international markets by assuming that only agents of type A can use these markets to insure. Suppose that the foreign insurance provides ϕ_s to type A in state s, $s = 1, ..., S$, for each unit of endowment that the type A commits to the international markets. To make the problem interesting, suppose that accessing the international markets has a cost π. Thus, if the type A chooses to insure ψ units of her endowment abroad, she will be able to consume

$$y_s^A = e_s^A + \phi_s\psi - \pi\psi$$

in state s, $s = 1, ..., S$. We make the assumption that the transfers are a pure insurance, that is, $E(\phi_s) = 0$. Note that this requires agent A to transfer income to international markets in some states ($\phi_s < 0$ for those s).

The trade-off is clear. If there is no type B, the optimal foreign market participation will weigh the benefits of insurance against the costs of buying it, π. When insurance is costless, the agent insures completely. Access to costly international markets will now determine the outside option of the type A agent. Let ψ_{aut} denote the optimal portfolio of international insurance type A would choose in the absence of B:

$$\begin{aligned}
&\psi_{aut} = \arg\max_{\psi}\left\{\frac{1}{1-\beta}\sum_{s=1}^{S} p_s u(y_s^A)\right\} \\
&s.t. \\
&y_s^A = e_s^A + \phi_s\psi - \pi\psi, \qquad \forall s = 1, ..., S \\
&\psi \geq 0.
\end{aligned}$$

We introduce the last constraint because of the positive cost of purchasing insurance, π. Allowing agents to buy negative amounts may in this formulation lead them to do so for values of π high enough, as it can raise their average consumption. We let v_{aut}^A be the lifetime expected utility type A gets from optimally participating only in the international markets.

Besides the foreign markets, type A can also enter into a risk sharing relationship with type B. Domestic risk sharing is subject to limited commitment. Agents can walk away from the relationship at any point. If this happens, the domestic risk sharing relationship breaks down forever. We view limited commitment as a consequence of institutional imperfections in the domestic markets, such as poor contract enforcement. The main problem is that these agents cannot sign a binding contract committing their future income flows to the relationship. The voluntary participation constraint must hold in all dates and states, and will limit the amount of risk sharing attainable in this economy.

In general, the evolution of risk sharing and consumption in this economy is history-dependent. Denote by $s^t = \{s_0, ..., s_t\}$ the history of the states of nature through period t. Agents enter the risk sharing arrangement by specifying consumption allocations ($c^A(s^t)$, $c^B(s^t)$) and foreign market participation by type A, $\psi(s^t)$ for each period, and each possible history s^t, subject to the participation constraint of each agent in each date and for all histories,

$$E_t \sum_{\tau=t}^{\infty} \beta^{\tau-t} u(c_\tau^A, s^\tau) \geq E_t \sum_{\tau=t}^{\infty} \beta^{\tau-t} \gamma u(y_\tau^A, s^\tau) = \gamma \left(u(y_t^A, s^t) + \beta v_{aut}^A \right), \qquad \forall t, s^t, \tag{2}$$

$$E_t \sum_{\tau=t}^{\infty} \beta^{\tau-t} u(c_\tau^B, s^\tau) \geq E_t \sum_{\tau=t}^{\infty} \beta^{\tau-t} \gamma u(e_\tau^B, s^\tau) = \gamma \left(u(e_t^B, s^t) + \beta v_{aut} \right), \qquad \forall t, s^t, \tag{3}$$

and the aggregate resource constraint in the economy,

$$c_t^A + c_t^B = y_t^A + e_t^B, \qquad \forall t. \tag{4}$$

The participation constraints state that any risk sharing arrangement must give each agent a lifetime expected utility that is at least as great as the lifetime utility the agent would get by reneging on the arrangement and consuming her endowment from that period on. The formulation is flexible and incorporates the possibility of a punishment, by introducing a parameter γ. When there is no enforcement at all, $\gamma = 1$, and we are in a world of no commitment. When $\gamma < 1$, there is some punishment that can be inflicted in case an agent reneges, and thus a wider range of risk sharing relationships are sustainable. We think of the parameter γ as reflecting the quality of a country's institutions, with lower values reflecting better institutional quality.

It is easy to establish the first best benchmark. An allocation ($c^A(s^t)$, $c^B(s^t), \psi(s^t)$) is first best if the ratio of marginal utilities $u'(c_t^A)/u'(c_t^B)$ is constant across time and states, and the economy consumes its full endowment every period, $c_t^A + c_t^B = y_t^A + e_t^B$, $\forall t$.

3.2 Recursive Solution: the General Case

How can we determine how much risk sharing and foreign market participation takes place in this economy? While for the most part we will be comparing steady states, it is useful to write down the general formulation, in order to highlight the most important features of the optimal contract in the presence of a varying outside option for A. Type A simultaneously chooses the extent of her participation in the foreign markets and the amount of risk sharing that is taking place in the domestic relationship.

The recursive representation of the problem above can be obtained by introducing a state variable, v, which represents the expected lifetime utility promised to one of the agents, and giving a recursive structure to the participation constraints. In particular, let v be the utility promised to agent B, and $P^A(v)$ be the lifetime utility that A can attain. $P^A(v)$ is given by the following Bellman equation:[2]

$$P^A(v) = \max_{\psi,\{c_S,w_s\}_{s=1}^S} \sum_{s=1}^{S} p_s \left[u(Y_s + \phi_s\psi - \pi\psi - c_s^B) + \beta P^A(w_s)\right] \tag{P}$$

$s.t.$

$$\sum_{s=1}^{S} p_s \left[u(c_s^B) + \beta w_s\right] \geq v \tag{PK}$$

$$u(c_s^B) + \beta w_s \geq \gamma \left[u(e_s^B) + \beta v_{aut}\right] \qquad \forall s = 1, ..., S \tag{PC^B}$$

$$u(Y_s + \phi_s\psi - \pi\psi - c_s^B) + \beta P^A(w_s) \geq \gamma \left[u(e_s^A + \phi_s\psi - \pi\psi) + \beta v_{aut}^A\right] \;\; \forall s = 1, ..., S \tag{PC^A}$$

$$\psi \geq 0 \tag{INS}$$

$$c_s^B \in [0, Y_s + \phi_s\psi - \pi\psi]$$

$$w_s \in [v_{aut}, v_{\max}]$$

Equation (P) is the Bellman equation for the value function of type A. The way the program has been set up, type A chooses foreign market participation ψ, consumption levels c_s^B, and the expected lifetime utility levels she promises to type B in each state, w_s^B, to maximize lifetime utility subject to the constraints. In particular, (PK) is the "promise-keeping constraint," which ensures that type B does get the expected utility she has been promised in the previous period. The following S constraints, (PC^B), are the participation constraints of type B. These are recursive representations of the general participation constraint, (3), for each state of nature. Intuitively, the risk sharing contract (c_s^B, w_s^B) offered to agent B in each state s should be such that the agent is willing to stay in the

[2] See Kocherlakota (1996), Ljungqvist and Sargent, (2000, ch. 15).

risk sharing relationship given the outside option of consuming her endowment from that period on. The parameter $\gamma \leq 1$ is meant to measure the quality of domestic institutions. (PC^A) are the participation constraints of type A. The condition (INS) prevents type A from taking on negative amounts of foreign insurance. The last two constraints restrict the policy functions to the feasible set. Compared to the canonical version of the model, type A's option to insure in the foreign markets introduces another control variable, the optimal foreign market participation ψ.

Let μ be the multiplier on the promise-keeping constraint (PK), $p_s\lambda_s$ the multipliers on each of the participation constraints for B, (PC^B), $p_s\theta_s$ the multipliers on each of the participation constraints for A, (PC^A), and δ be the multiplier on the ψ-nonnegativity constraint (INS). Then the first-order conditions with respect to c_s, w_s, $s = 1, ..., S$, and ψ are:

$$-(1+\theta_s)u'(Y_s + \phi_s\psi - \pi\psi - c_s^B) + (\mu + \lambda_s)u'(c_s^B) = 0 \qquad \forall s = 1, ..., S \tag{5}$$

$$(1+\theta_s)P^A(w_s) + (\mu + \lambda_s) = 0 \qquad \forall s = 1, ..., S \tag{6}$$

$$\begin{aligned} &\sum_{s=1}^{S} p_s(\phi_s - \pi)u'(Y_s + \phi_s\psi - \pi\psi - c_s^B) + \\ &+\sum_{s=1}^{S} p_s\theta_s(\phi_s - \pi)\left[u'(Y_s + \phi_s\psi - \pi\psi - c_s^B) - \gamma u'(e_s^A + \phi_s\psi - \pi\psi)\right] + \\ &+ \delta = 0. \end{aligned} \tag{7}$$

By the envelope theorem,

$$P'(v) = -\mu.$$

The first two first order conditions can be combined to yield the optimal relationship between consumption given to B and promised utility, in each state:

$$-\frac{u'(Y_s + \phi_s\psi - \pi\psi - c_s^B)}{u'(c_s^B)} = P'(w_s) \tag{8}$$

Following the discussion in Ljungqvist and Sargent (2000), we observe that there are three kinds of states. If in state s neither (PC^A) nor (PC^B) bind, $\lambda_s = \theta_s = 0$, $w_s = v$, $P^A(w_s) = P^A(v)$, and the values of consumption are solved from equation (8). In states where (PC^B) binds, $\lambda_s > 0$, $w_s > v$, $P^A(w_s) < P^A(v)$. Agent B's promised utility increases, and A's lifetime utility decreases as a result. In this state, c_s^B and w_s^B can be obtained by solving (8), and (PC^B) holding with equality, for a given equilibrium value of ψ. The opposite is true for states in which (PC^A) binds. In those states, $w_s < v$, and $P^A(w_s) > P^A(v)$.

The optimal participation in foreign markets, ψ, is determined by equation (7). Though it is a complicated expression, it contains three distinct parts from which we can glean some intuition for what drives the choice of ψ. The first term is the "optimal portfolio" term. It trades off the benefits of insurance against its cost π, and would be present whether or not participation constraints for A bind. The second term comes from the effect of portfolio choice on A's participation constraints. In particular, if in any state s A's participation constraint binds (i.e. $\theta_s > 0$), agent A will take into account the effect of foreign insurance on her participation constraint in that state. Note that we cannot tell in the general case whether raising ψ relaxes or tightens the constraint, thus the effect of the presence of these constraints on the equilibrium amount of foreign participation is ambiguous. In the specific two-state examples we work out below, however, the intuition for this effect will be quite clear. The third term simply comes from the non-negativity constraint we imposed on the foreign market participation.

Kocherlakota (1996, Propositions 4.1 and 4.2) shows that starting from an initial value of v_0 for which non-trivial risk sharing is possible, the relationship converges to a steady state, in which the first best level of risk sharing may or may not be attained. Unfortunately, an analytic solution to the Bellman equation in (P) is not known even in the canonical version of the model which does not include endogenous foreign market participation.

In order to get an intuition about how the equilibrium amount of risk sharing responds to changing opportunities to participate in foreign markets, we will assume functional forms and solve for the value and policy functions numerically. In all cases we consider, a straightforward value function iteration mechanism described in Judd (1998, ch. 12) is sufficient to generate a solution.

We approach the problem by considering the two extreme cases, those of purely idiosyncratic and purely aggregate risk. Looking at simple versions of this problem lets us gain a fair bit more intuition about the effect of financial liberalization in this environment. It also allows us to reduce the number of states to the minimum possible value of 2, thereby significantly reducing the dimensionality of the policy function.

3.3 Case I: Purely Idiosyncratic Risk

We now consider the first of the two polar cases. For simplicity, suppose there are two states of nature, $s = 1, 2$, and the states have equal probability of $\frac{1}{2}$. When there is no aggregate risk, agents' incomes are perfectly negatively correlated. In particular, we assume that in $s = 1$, group A's per capita income endowment is $e_1^A = 1 + \varepsilon$, and group B's per capita endowment is $e_1^B = 1 - \varepsilon$. In $s = 2$, the per capita endowments are reversed. The total endowment in the economy equals 2 in every period.

The foreign insurance provides $-\phi^f$ to type A in $s = 1$, and ϕ^f in $s = 2$, for each unit of endowment that the type A commits to the international markets. If the type A chooses to insure a share ψ of her endowment risk abroad, she will be able to consume

$$y_1^A = 1 + \varepsilon - \phi^f \psi - \pi\psi$$

in $s = 1$, and

$$y_2^A = 1 - \varepsilon + \phi^f \psi - \pi\psi$$

in $s = 2$.

It is useful to restate the recursive formulation for this special case, writing out participation constraints state by state:

$$P^A(v) = \max_{\psi,\ \{c_s^B, w_s^B\}_{s=1,2}} \left\{ \sum_{s=1}^{2} \frac{1}{2} \left[u(2 + \phi_s\psi - \pi\psi - c_s^B) + \beta P^A(w_s^B) \right] \right\} \qquad (P')$$

$s.t.$

$$\frac{1}{2} \left[u(c_1^B) + \beta w_1^B + u(c_2^B) + \beta w_2^B \right] \geq v \qquad (PK')$$

$$u(c_1^B) + \beta w_1^B \geq \gamma \left[u(1 - \varepsilon) + \beta v_{aut} \right] \qquad (PC_1^{B\prime})$$

$$u(c_2^B) + \beta w_2^B \geq \gamma \left[u(1 + \varepsilon) + \beta v_{aut} \right] \qquad (PC_2^{B\prime})$$

$$u(2 - \phi^f \psi - \pi\psi - c_1^B) + \beta P^A(w_1^B) \geq \gamma \left[u(1 + \varepsilon - \phi^f \psi - \pi\psi) + \beta v_{aut}^A \right] \qquad (PC_1^{A\prime})$$

$$u(2 + \phi^f \psi - \pi\psi - c_2^B) + \beta P^A(w_2^B) \geq \gamma \left[u(1 - \varepsilon + \phi^f \psi - \pi\psi) + \beta v_{aut}^A \right] \qquad (PC_2^{A\prime})$$

$$\psi \geq 0 \qquad (INS')$$

$$c_s^B \in [0, Y_s + \phi_s\psi - \pi\psi]$$

$$w_s \in [v_{aut}, v_{\max}]$$

This formulation is quite general and includes a number of important special cases. The closed economy case is replicated when π is prohibitively high, so that even without type B, type A would not want to access the international markets ($\psi_{aut} = 0$). Then, $v_{aut}^A = v_{aut}$, and the domestic risk sharing relationship is intact. Another important special case is that of frictionless domestic markets given by $\gamma = -\infty$: the participation constraints never bind, and the first best outcome is achieved. At another extreme, suppose that there is no commitment, $\gamma = 1$, and international markets are costless ($\pi = 0$). Then, we know that $\psi_{aut} = \frac{\varepsilon}{\phi^f}$ (without B, type A opts for full insurance). Under these circumstances, domestic risk sharing relationship will most likely break down completely, because the type B agents would not be able to provide type A with favorable enough terms of domestic insurance without violating their own participation constraint. If domestic risk sharing breaks down, type B is completely uninsured. The discussion of the extreme cases provides an illustration that domestic risk sharing is likely to suffer the most when the cost of accessing foreign markets is low, and domestic institutions are poor. Even before going to a numerical solution, we can make two important remarks on the features of this problem.

Remark 1: If the first best is reached in this risk sharing contract, it necessarily means that there is no foreign market participation, $\psi = 0$, irrespective of the value of π. Due to the absence of aggregate uncertainty, the first best level of risk sharing implies that all agents' consumption is constant across time and states: agents are perfectly insured. Since risks are perfectly insurable within the economy, in the frictionless setting there is no role for international markets in smoothing consumption risk.

Participation in international markets reduces welfare in two ways, vis-a-vis the first best benchmark. First, it costs π, and thus reduces the aggregate endowment in both states. Second, and most importantly, because the agents' endowments are negatively correlated, type A's participation in the foreign markets actually lowers her ability to insure type B. In particular, whereas in the closed economy A had at her disposal ε in $s = 1$, with which to insure B's negative income shock of $-\varepsilon$, now in $s = 1$ agent A has only $\varepsilon - \phi^f\psi - \pi\psi$.

The feature that the first best benchmark is the same for each π is also convenient because as we consider the effects of financial liberalization on domestic risk sharing, we can judge the changing amount of domestic risk sharing against a constant benchmark.

Remark 2: When in equilibrium the amount of foreign participation is $\psi = 0$ and the first best level of risk sharing is not achieved, lowering barriers to international markets, π, actually decreases type A's welfare $P^A(v)$, for each v. This is a consequence of the envelope theorem. Evaluated at an optimum value of $\psi = 0$, $\frac{dP^A(v)}{d\pi} = -\sum_{s=1}^{S} p_s \theta_s \gamma \frac{dv^A_{aut}}{d\pi} < 0$.

How can lowering the international barriers type A faces make A worse off? International markets play two roles in our framework. First, insuring abroad may improve A's lifetime utility by smoothing some of A's consumption risk. Second, ability to access international markets raises A's outside option, irrespective of whether A actually participates in the international markets or not. The second effect is detrimental to A's ability to insure domestically. Thus, if there are parameter values under which A chooses not to insure abroad at all ($\psi = 0$), only the second effect remains. By raising A's outside option, the presence of foreign markets actually decreases the amount of risk sharing attainable in the domestic relationship, lowering A's utility for a given v.

The pure idiosyncratic risk economy in this subsection provides the most drastic illustration of the perverse effects on international markets on domestic risk sharing. Though in the first best world international markets have no role, in the limited commitment framework their mere presence has a negative effect. The Remark above focuses on A's participation constraints, but B's constraints matter as well. Since A's insurance in foreign markets decreases aggregate welfare, type B has an incentive to induce A to lower her foreign market participation. The ability of type B to offer A better domestic risk sharing terms is limited, however, by type B's own participation constraints. There is only a limited amount of utility that B can give up before they start to bind.

We now provide a numerical illustration of the effect of financial opening on agents' welfare and consumption volatility. To do this, we assume a functional form for the utility function that is quadratic:

$$u(c) = 4c - \frac{1}{2}c^2.$$

The parameter values we pick are the following: $\varepsilon = 1$, $\phi^f = 1$, $\beta = 0.8$, $\gamma = 1$. Under these parameter values, $v_{aut} = 15$. We then find $P^A(v)$ for various values of π, barriers to international insurance markets. We can think of $P^A(v)$ as a Pareto frontier, as it gives the highest level of A's lifetime utility for each level of B's lifetime utility, v. $P^A(v)$ is obtained by value function iteration (Judd, 1998, ch. 12). Results are presented in Figure 1. The first best level of risk sharing is not achieved in this economy, thus one of the participation constraints binds at each t. The closed-economy Pareto frontier is symmetric around the 45-degree line, that is, if $P^A(v_1) = v_2$, then $P^A(v_2) = v_1$.

As we lower π, we see that the frontier shifts unevenly inward. In particular, two key observations can be made from this Figure. First, the Pareto frontier is no longer symmetric. The pairs $(v, P^A(v))$ of sustainable lifetime utilities become skewed in favor of A: if $P^A(v_1) = v_2$, then $P^A(v_2) > v_1$. Second, the range of values of v for which non-trivial domestic risk sharing is sustainable shrinks as we lower international barriers. This is intuitive: the higher A's outside option becomes, the lower is the maximum value of B's lifetime utility v for which A is willing to participate in the domestic risk sharing relationship. We also see that for each v, the lifetime utility of A, $P^A(v)$, decreases in π in this example, as long as π is high enough to sustain domestic risk sharing – an illustration of Remark 2.

While finding the value function $P^A(v)$ is informative about the combinations of the two agents' lifetime utilities that are sustainable in the economy, it does not tell us much directly about the amount of risk sharing and foreign market participation that occurs as π changes. We can perform comparative statics by finding steady state levels of risk sharing and foreign market participation for different values of π.

In a steady state, income transfers, and thus consumption, are constant over time in each state, though not necessarily constant across states (see Kehoe and Levine, 2001, Proposition 5). It is straightforward to show that in a steady state expected lifetime utility, denoted by $\overline{v}^i$, $i = A, B$, is constant for each agent as well. We can fully characterize the symmetric steady state by consumption values of each agent in each state, $\{\overline{c}_1^A, \overline{c}_2^A, \overline{c}_1^B, \overline{c}_2^B\}$. We label steady state values by an overbar.

The key limitation to the extent of risk sharing that takes place in this economy is the voluntary participation constraint that must be satisfied for each agent in each state and each period. In practice, risk sharing takes place by transferring income from the group that has a high current income realization to the other group. Naturally, then, the only relevant participation constraints will be those in which the current realization of income is high for that particular group.

There are two possibilities. If in steady state, the participation constraint of the agent that is experiencing a high income shock does not bind,

$$u(\overline{c}_1^A) + \beta \overline{v}^A > \gamma \left(u(1+\varepsilon) + \beta v_{aut}^A \right),$$

$$u(\overline{c}_2^B) + \beta \overline{v}^B > \gamma \left(u(1+\varepsilon) + \beta v_{aut} \right),$$

then the first best level of risk sharing is achieved, and each agent's consumption is constant across time. Notice that in this type of steady state no participation in the international markets takes place.

If on the other hand in steady state the participation constraints bind, the steady state consumption values $\{\overline{c}_1^A, \overline{c}_2^A, \overline{c}_1^B, \overline{c}_2^B\}$ are those that maximize $\overline{v}^A$, subject to participation constraints holding with equality:

$$u(\overline{c}_1^A) + \beta \overline{v}^A = \gamma \left(u(1+\varepsilon - \phi^f \psi - \pi \psi) + \beta v_{aut}^A \right),$$

$$u(\overline{c}_2^B) + \beta \overline{v}^B = \gamma \left(u(1+\varepsilon) + \beta v_{aut} \right).$$

We illustrate how the steady state amount of risk sharing changes as barriers to accessing the foreign markets, π, are lowered. Here, we consider the same set of parameter values as we used to construct $P^A(v)$ above. At these parameter values, the closed economy does not achieve perfect risk sharing, and the steady state is unique. The effects we discuss are much more general, however.

Figure 2 illustrates the patterns of consumption for the two types in the two states as a function of the cost of accessing international markets, π. Thicker lines represent consumption values of type A, and thinner lines of type B. Without domestic or international risk sharing, each type would consume her endowment, which is equal to 2 in the high state, and 0 in the low state. Perfect risk sharing, on the other hand, implies that in a symmetric steady state consumption is equal to 1 for all agents in all states.

How does the option of accessing the international markets affect risk sharing at home? We can divide values of π into four intervals. First, when the cost of accessing the international markets is prohibitive, $\pi > \pi_1$, they to not raise type A's outside option, $\psi_{aut} = 0$, and $v^A_{aut} = v_{aut}$. The foreign markets are too expensive, and even if left alone, type A would choose not to participate in them. In this case, risk sharing is the same as in the closed economy.

When $\pi < \pi_1$, the presence of foreign markets does raise type A's outside option, because $\psi_{aut} > 0$. When $\pi_2 < \pi < \pi_1$, the outside option of type A is rising, but foreign markets are costly enough that type B can induce A to stay entirely in the domestic risk sharing arrangement. Notice that as π decreases and the outside option of type A rises, the amount of risk sharing taking place decreases for both agents, but type A's consumption is higher in both states than the corresponding consumption of type B. This is because the rising outside option for A both reduces the amount of risk sharing available to agents and increases the transfer of utility that type B must make to keep type A at home. In this interval, type A does not participate in the foreign markets, $\psi = 0$. Thus, while there is less risk sharing at home, aggregate consumption is still flat.

When π falls below π_2, some foreign market participation starts to occur. As some of the type A's consumption risk is now insured abroad, her consumption volatility starts decreasing. But this also means that there is less possibility of risk sharing at home, and consumption volatility of type B continues rising. This is precisely the effect illustrated in the simple example of the previous section. While participation in international markets can decrease consumption volatility of some agents, it can have adverse effects on consumption volatility of others. Type A's rising participation in foreign markets implies that it is less able and willing to insure type B.

Finally, when $\pi \geq \pi_3$, international markets are so accessible, and thus type A's outside option is so high, that type B cannot offer good enough terms of insurance contract at home without violating her own participation constraint. Thus, all domestic risk sharing breaks down and type A participates only in the international markets. The problem with this, of course, is that type B is now completely uninsured. Aggregate consumption volatility is highest, and the type B agents are least insured, when opening up to international markets implies a complete breakdown of domestic risk sharing.

3.4 Case II: Aggregate Risk

Suppose instead that all agents have identical endowments in each period. In particular, in $s = 1$, $e_1^A = e_1^B = 1 + \varepsilon$, and in $s = 2$, $e_2^A = e_2^B = 1 - \varepsilon$. Notice that when the economy is closed, there is no scope for risk sharing. When the economy is open, the first best allocation requires that type A pools the entire country risk, and insures it optimally in the foreign markets, given the cost of access π. The international markets are modeled exactly the same as in the previous subsection, transferring $-\phi^f$ in $s = 1$ and ϕ^f in $s = 2$ for each unit of endowment insured abroad.

When the relationship between types A and B is subject to limited commitment, we can characterize it by setting up a program similar to that of the previous subsection, as a value maximization of type A, $P^A(v)$, subject to constraints:

$$P^A(v) = \max_{\psi,\ \{c_s^B, w_s^B\}_{s=1,2}} \left\{ \sum_{s=1}^{2} \frac{1}{2} \left[u(Y_s + \phi_s\psi - \pi\psi - c_s^B) + \beta P^A(w_s^B) \right] \right\} \qquad (P'')$$

$s.t.$

$$\frac{1}{2}\left[u(c_1^B) + \beta w_1^B + u(c_2^B) + \beta w_2^B\right] \geq v \qquad (PK'')$$

$$u(c_1^B) + \beta w_1^B \geq \gamma\left[u(1+\varepsilon) + \beta v_{aut}\right], \qquad (PC_1^{B''})$$

$$u(c_2^B) + \beta w_2^B \geq \gamma\left[u(1-\varepsilon) + \beta v_{aut}\right], \qquad (PC_2^{B''})$$

$$u(2 - \phi^f\psi - \pi\psi - c_1^B) + \beta P^A(w_1^B) \geq \gamma\left[u(1+\varepsilon-\phi^f\psi - \pi\psi) + \beta v_{aut}^A\right], \qquad (PC_1^{A''})$$

$$u(2 + \phi^f\psi - \pi\psi - c_2^B) + \beta P^A(w_2^B) \geq \gamma\left[u(1-\varepsilon+\phi^f\psi - \pi\psi) + \beta v_{aut}^A\right], \qquad (PC_2^{A''})$$

$$\psi \geq 0 \qquad (INS'')$$

$$c_s^B \in [0, Y_s + \phi_s\psi - \pi\psi]$$

$$w_s \in [v_{aut}, v_{\max}]$$

Examining the constraints allows us to get a sense of what limits efficient risk pooling in this economy. The participation constraint of type B in the high state ($PC_1^{B''}$) shows that rather than transferring income to type A for the purposes of insurance in the international markets, type B will be tempted to consume her current high endowment, an intuition identical to that of the previous subsection. When the economy is experiencing a negative aggregate shock, type A is the only one with access to a net transfer from abroad. Efficient risk pooling would call on type A to redistribute some of the positive income to type B, but that is limited by A's participation constraint in this state of nature, $(PC_2^{A\prime\prime})$.

It is important to note here that the relationship between types A and B is very different here compared to the idiosyncratic risk case. In that case, domestic and foreign insurance were substitutes for type A. Here, engaging with type B serves no insurance purpose for type A, and to induce type A to take on a risk pooling role, type B must transfer income to type A. Type B's ability to decrease her own utility in the risk pooling arrangement is itself limited by her voluntary participation constraint.

Once again we use a numerical example to provide an illustration. We could repeat the exercise in the previous section, and look at the response of risk pooling to changing values of π. However, when the economy is subject to aggregate risk, the first best frontier changes as we vary π, thus we don't have a natural benchmark. Instead, we use this example to highlight the importance of quality of contract enforcement, γ, in determining the amount of risk pooling achieved in this economy. For simplicity, we assume that there are no barriers to international markets, $\pi = 0$. The first best in this economy is achieved by sharing all of the aggregate risk in the international markets, and giving each agent constant consumption across time. Notice that the first best frontier in this economy is the same as in the idiosyncratic risk case of the previous subsection, but is achieved very differently, through full participation in international markets.

How do institutions affect the amount of risk sharing achieved in this economy? Figure 3 plots the first best frontier and the value functions, $P^A(v)$, for several values of γ. Several aspects of this figure are worth highlighting. First, better institutions imply that the economy is closer to the first best frontier. As institutions get worse, the frontier shifts inward. This implies both that $P^A(v)$ is lower for a given v, and that the range of B's lifetime utilities, v, for which non-trivial risk sharing is attainable is narrower. For high enough γ (in this example about 0.8875), no risk pooling is possible, and type A insures in the international markets alone, leaving B completely uninsured. Second, the figure illustrates the distributional consequences of uneven access to the international markets. When A can insure abroad, she must be given lifetime utility at least as great as what she would get from perfect insurance abroad (17.5 in this case, given by a dashed line). This necessarily means that, as B engages A in an insurance relationship, B's lifetime utility is smaller than

A's. It's important to note that this statement is true whether or not the economy achieves an allocation that is first best.

To give a sharper picture of the amount of insurance agents get in this arrangement as a function of γ, we can compare steady states in this economy in a manner similar to the previous subsection. Figure 4 plots the steady state values of consumption for different levels of institutional quality. There are several distinct insurance relationships that can arise, depending on the value of γ. Starting at the left-hand side of the graph, when $\gamma \leq \gamma_1$, institutions are strong enough that a risk pooling contract under which both agents are perfectly insured and receive equal lifetime utility is sustainable. As we move into the interval $\gamma \in (\gamma_1, \gamma_2)$, the risk pooling relationship can no longer sustain an equitable allocation. In this area, aggregate risk is still perfectly insured by the economy, and both agents are perfectly insured. But to induce A to perform the risk pooling role, B must give up utility. Thus, while both agents' consumption is constant across time, A's consumption is higher than B's.[3] As we move into the interval $\gamma \in (\gamma_2, \gamma_3)$, imperfect institutions prevent efficient foreign insurance, even in aggregate. Neither agent is now perfectly insured, but the risk pooling relationship still operates and A provides positive insurance to B. As we lower institutional quality in this interval, agents are less and less well insured. Finally, when $\gamma > \gamma_3$, no risk pooling is sustainable in equilibrium. This means that A leaves the domestic relationship entirely, and insures optimally (perfectly) abroad. It also means that B is completely uninsured, and consumes her own endowment in each period.

To summarize, the first best outcome of efficient risk pooling may not be achieved in this economy. When risks are purely aggregate, clearly access to international markets improves the economy's aggregate consumption volatility. Type A certainly reaches the optimal level of insurance, given the cost of access π. The benefits of financial opening may not spread to those agents that do not have direct access to international markets.

4 Conclusion

The latest empirical evidence demonstrates that increasing international financial integration is actually associated with higher consumption volatility in developing countries. This finding is difficult to rationalize within the framework of representative agent models of risk sharing.

[3] Generally, when the economy attains a first best allocation, as it does in this interval, the steady state is not unique. In constructing this Figure, we select for each γ the steady state in which the two types' consumption values are closest to each other – the most equitable steady state.

The main shortcoming of representative agent models is that they can only tell us about the role of international financial markets in sharing aggregate country risk. The canonical models also do not address the issue of how aggregate risk is pooled among agents for the purposes of international risk sharing. This paper shows that focusing on agent heterogeneity when domestic risk sharing and risk pooling are subject to frictions can help us rationalize the empirical evidence. In the model we presented, agents are heterogeneous in both their income process and in whether or not they have access to international markets. When we consider the consequences of agent heterogeneity in an economy with underdeveloped institutions and financial markets, we reach three main conclusions.

First, if income risks are idiosyncratic, financial opening will have first-order effects on the domestic financial markets. International markets can be used by agents to insure against not only aggregate but also idiosyncratic risks. When some agents participate in the international risk sharing markets, domestic risk sharing deteriorates, leading to an increase in consumption volatility. The mechanism we suggest here reproduces a positive relationship between capital flows and consumption volatility found in the data.

Second, when agents face only aggregate income risk, the underdeveloped financial system will prevent efficient pooling of risk across agents for the purposes of international insurance. Thus, for aggregate risk, the benefits of access to international markets are much lower in this framework than in the representative agent model.

Finally, considering agent heterogeneity allows us to highlight distributional consequences of financial liberalization. While agents with access to international markets benefit from expanded opportunities, those that do not have access benefit less, and in fact may experience an increase in consumption volatility and a reduction in welfare.

Can we find empirical evidence corroborating the mechanism we describe here? Our focus on the quality of the financial system and institutions receives some empirical support in Bekaert, Harvey and Lundblad (2004), who show that financial liberalization lead to an increase in consumption volatility in countries with the least developed financial systems and low institutional quality. In contrast, consumption volatility fell after financial liberalization in countries with well-developed financial systems and good institutions. These results suggest that focusing on institutions as we do in this paper is a fruitful direction, but are admittedly uninformative about the precise channel for the effect.

More importantly, is the mechanism we are proposing plausible? In our model, aggregate consumption volatility can increase after financial liberalization when idiosyncratic shocks are large enough relative to both the size of the economy and the aggregate shock that, when left uninsured, will impact aggregate consumption. Clearly, such shocks do not correspond to *iid* income shocks to individual atomistic consumers or firms, which would average out in a country populated by a very large number of such agents. The idiosyncratic shocks in our model are better interpreted as shocks to important sectors in the economy, or perhaps shocks to large firms. Gabaix (2004) shows that when economies are dominated by small numbers of very large firms – as appears to be the case in practice – firm-specific shocks will lead to aggregate fluctuations. While the line of research that focuses on idiosyncratic shocks to big agents is broadly consistent with the kinds of effects we model here, it still remains in its infancy.

The simple framework we presented in this paper focuses narrowly on the opportunities for insuring income risk domestically and internationally. Clearly, financial liberalization has a variety of other effects on developing economies. Not the least important, for instance, is the role of capital flows in generating output growth through their ability to mobilize foreign savings for domestic investment, or their role in technology transfer. The effects we reveal here should nevertheless be taken into account in building a complete picture of financial liberalization in developing countries.

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Figure 1: $P(v)$ for different values of π, with purely idiosyncratic risk

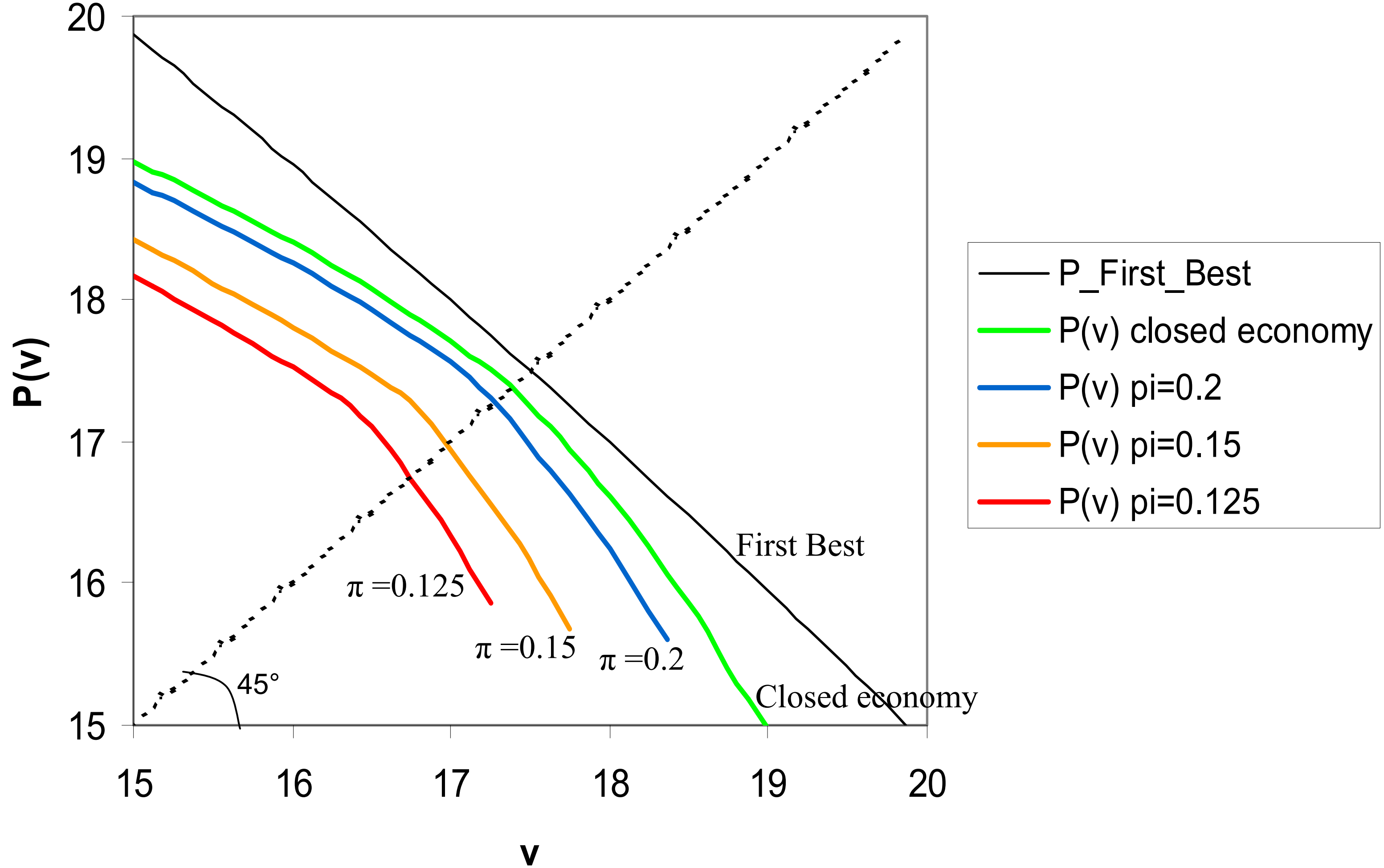

Figure 2: Steady state values of consumption as a function of access to foreign markets, purely idiosyncratic risk

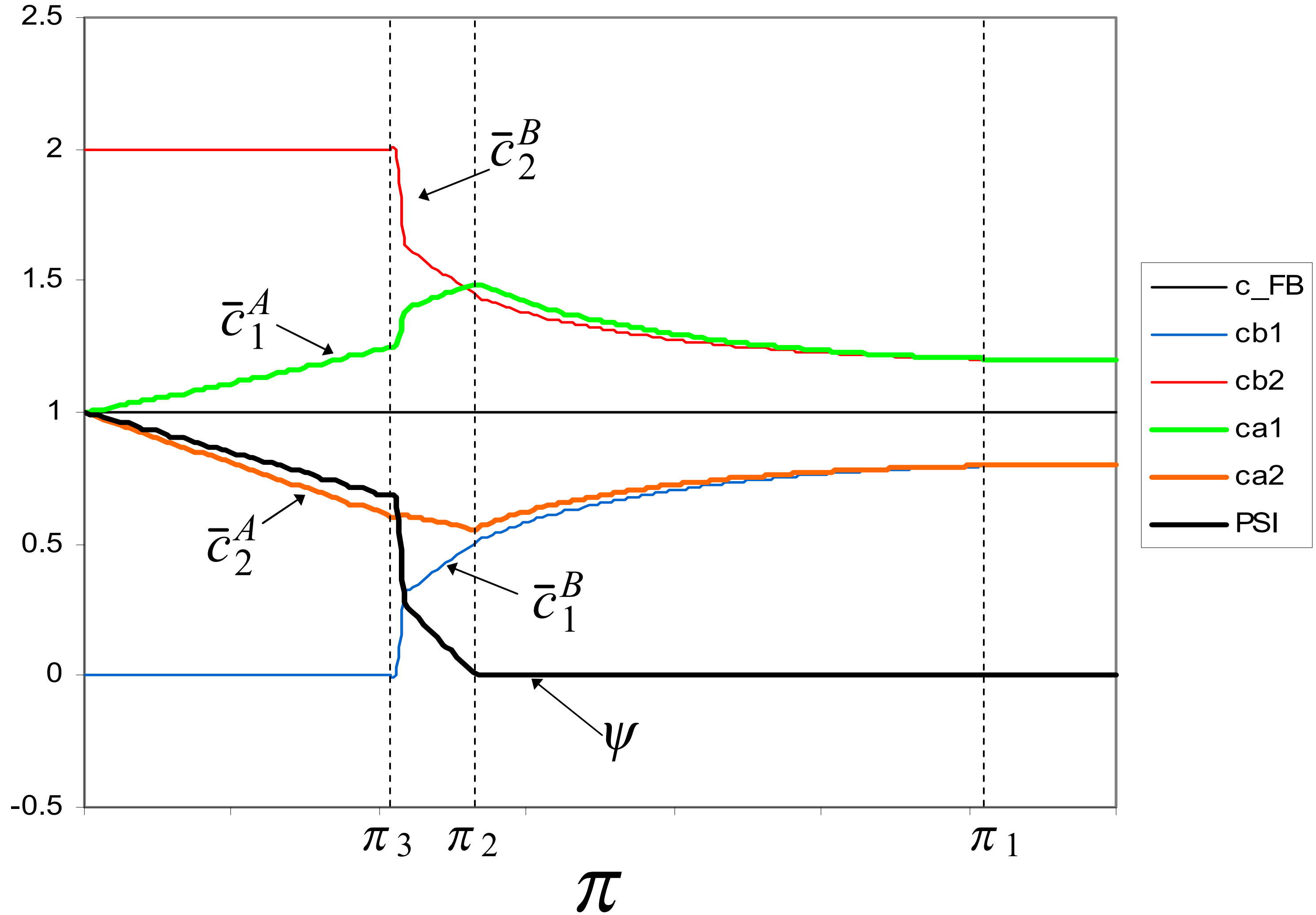

Figure 3: $P(v)$ for different values of γ, with purely aggregate risk

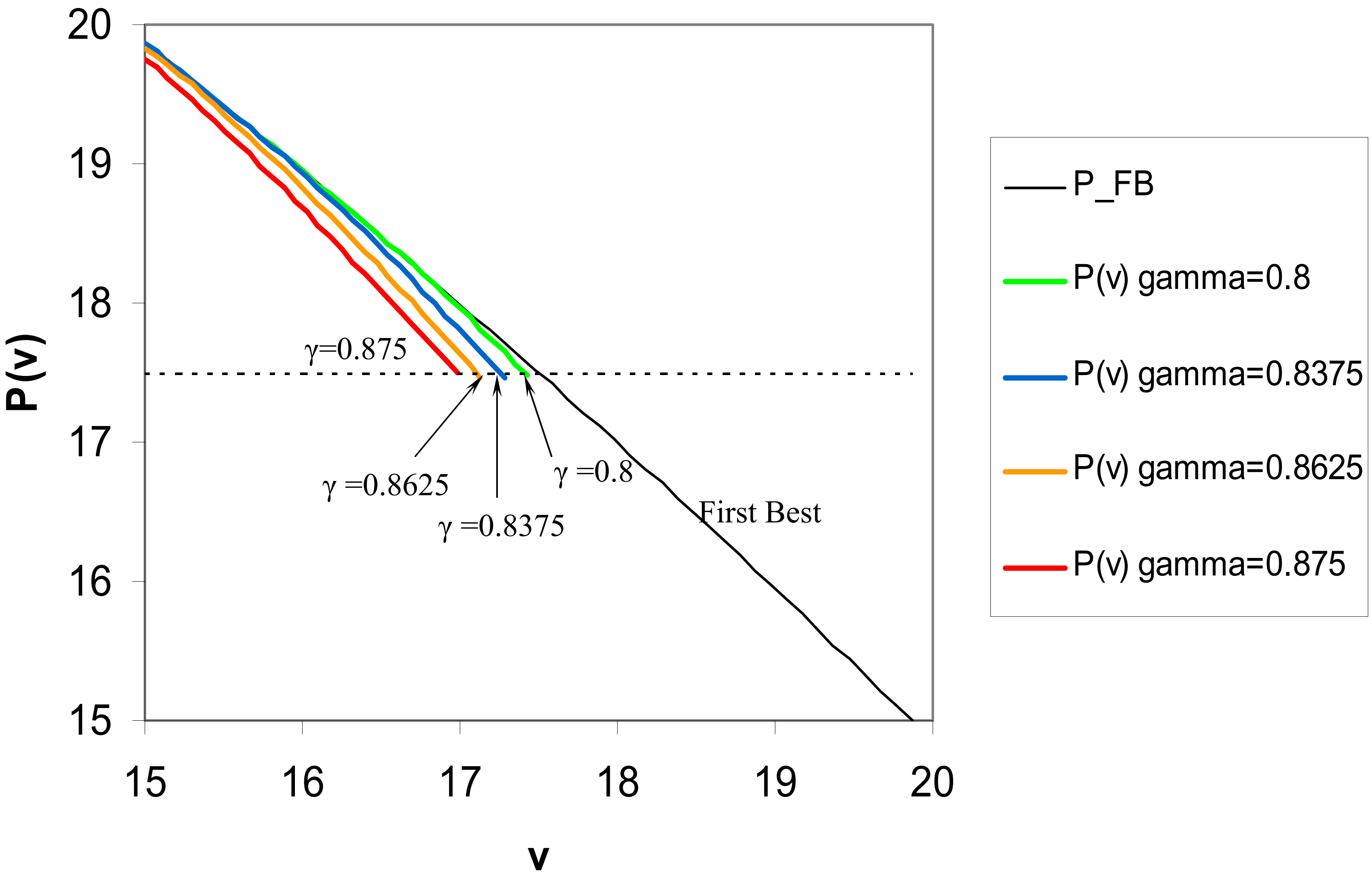

Figure 4: Steady state values of consumption as a function of domestic institutions, purely aggregate risk