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Abstract

This paper presents a new explanation for the sustained pattern of international net capital flows by modifying the standard consumption capital asset pricing model (CCAPM) to create net capital flows beyond the initial period. In addition to the well established link between asset returns and the cyclical correlation between countries in standard CCAPM models, our model links asset flows to the cyclical correlation. In particular, the model predicts that a country that has a low correlation with the global cycle should see net capital inflows. We provide strong empirical evidence in support of this link and a 0.1 increase in the correlation leads to a 0.5-0.7 percentage point decrease in the net capital inflows as a % of GDP.

JEL-Codes: F360, F430.

Keywords: net capital flows, productivity, growth, portfolio diversification.

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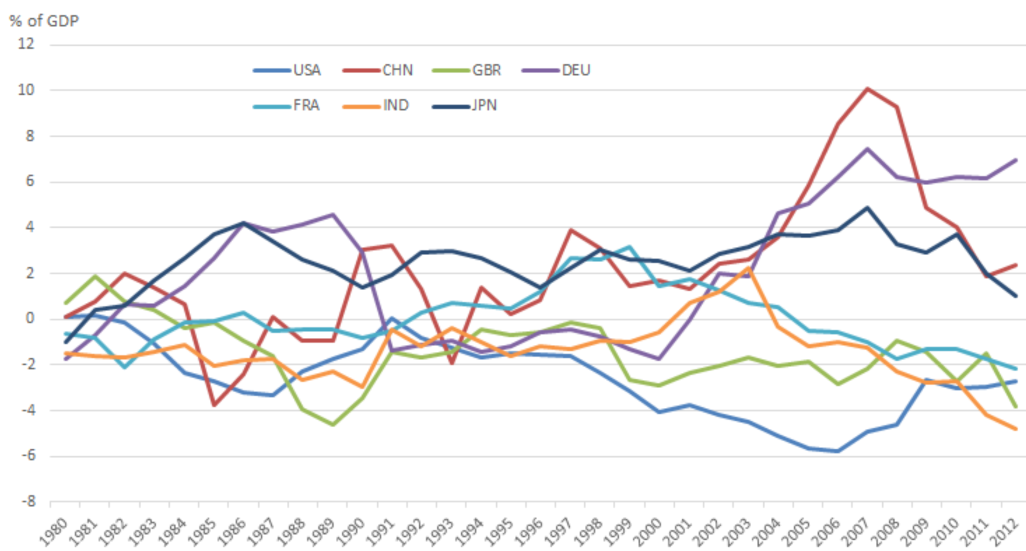
1 Introduction

The aim of this paper is to show that a modified consumption capital asset pricing model (CCAPM) can produce a sustained pattern of international net capital flows, where some countries have net capital inflows and others negative net capital inflows or net capital outflows over extended periods. The modification presented in this paper includes trading restrictions that require agents who want to smooth their consumption to rebalance their portfolio every period and cause sustained net (and gross) capital flows, the sign of which is linked to the correlation between home asset returns and the global portfolio returns. In addition, the paper aims to provide empirical evidence that supports this link of the model.

An example of these large and sustained net capital flows is shown in Figure 1.[1] While the US, the UK and India had almost exclusively negative net capital (out-)flows over the past 35 years, Japan, China and Germany had almost exclusively positive net capital (out-) flows.

Figure 1: Current Accounts as percent of GDP for selected countries since 1980



Data source: IMF WEO

[1]As in the figure, we proxy net capital flows with the current account balances. Net capital inflows correspond to current account deficits and negative net capital inflows or net capital outflows with current account surpluses.

The pattern of these sustained net capital flows has been a topic of research at least since the postulation of the Lucas (1990) puzzle and has remained a hot topic in the literature since, with some earlier drivers identified in Chinn and Prasad (2003), while more recent works include Caballero et al. (2008), Gourinchas and Jeanne (2013) or Ohanian et al. (2018). The modified CCAPM introduced in this paper is aimed at contributing to the explanations of these flows.

Some other features of a CCAPM have already been researched extensively in the literature: for instance, the pattern of international asset returns in Lustig and Verdelhan (2007), Hassan (2013), Berg and Mark (2018) or David et al. (2014), and the stability of portfolios in Kraay and Ventura (2002), Kraay and Ventura (2000) or De Santis (2010). In both cases, the CCAPM is an important driver of the pattern in the data; however, to the authors' knowledge, explaining the pattern of sustained net capital flows with the CCAPM has remained elusive until the model presented in this paper. This modified model is able to produce sustained net capital flows leading to the additional feature of the data being explained by the CCAPM.

The key modification to the standard CCAPM is the addition of new, undiversified assets every period in a consistent pattern including the restriction that this asset was not tradable before. Examples of this would be the government issuing additional new bonds to finance an increase in its debt.[2] In contrast to existing and rolled over debt, this new debt cannot be traded beforehand.

The new assets cause the representative agents of each country to reshuffle their portfolio. Specifically, as the number of available assets increase in one country, the agents in other countries want some share of this to maintain a diversified portfolio and buy more of these assets. These new assets have different prices across countries even if the same number of new assets is created in each country. Because of this, agents whose assets have a lower price have to use their consumption good to purchase the more expensive assets. This results in

[2] At least for the US and Euro area, the main driver of the financial account are debt securities, which would mainly fall under this second category.

a net capital flow.[3]

As will be shown in the modified CCAPM below, the net capital flows created by the trading restriction follow a particular pattern. Assets that are highly correlated with the global portfolio are less expensive than assets that are less correlated with the global cycle. Agents that hold assets that are correlated with the global portfolio will not be able to simply exchange their assets for an equal amount of uncorrelated assets. In addition to some share of their asset, they have to give some of their consumption good as well to obtain the uncorrelated assets. This leads to a situation in which countries that are not correlated with the global cycle should have net capital inflows, while countries that are correlated with the global cycle should have net capital outflows.

This implication is subsequently put to the test and it is empirically shown that international net capital flows indeed to a large degree follow the pattern suggested by the model. This leads to the important empirical finding that asset return correlations as modeled in the modified CCAPM are an important determinant of net capital flows. This is consistent with the finding that the magnitude of the returns by themselves do not appear to be the main driver of flows (e.g. Gourinchas and Jeanne (2013)), and instead the correlation with the global cycle have to be taken into account.

The remainder of the paper is structured as follows: The model is presented in Section 2, followed by the data used to test the model empirically in section 3. Section 4 presents the main empirical results; section 5 concludes.

2 Model

Aside from the endowment process related to the trading restriction, the model presented here is quite similar to the standard consumption capital asset pricing model (CCAPM), as for example in Lucas (1978) or Lucas (1982) as well as the variations utilized more recently

[3] If the agent just exchanges assets, there is a change in the overall asset position of the agent, but the financial account remains 0 and there is no net capital flow.

to explain the pattern of returns in Lustig and Verdelhan (2007) or David et al. (2014). This endowment economy model has $n > 2$ representative agents i, one in each country. Agents receive a stochastic endowment w_{it} of the identical, perishable but tradable numeraire consumption good C_{it} every period.[4] All endowments are assumed to be identically distributed, but some of the endowments are assumed to be more correlated with each other than others. The expected endowment in period t is given by $E(w_{it}) = w_t$ and its variance is given by $V(w_{it}) = V(w_t)$ so neither vary across agents. We assume that the endowments follow the correlation matrix $MCOR$ which is known to the agents.

In a three agent world, one analogy would be that each of the three agents owns an apple orchard. Two of the orchards are on one continent (Alpha) and the third on a second continent (Beta). Each orchard produces the same expected number of apples, but continents might have different weather. This causes the number apples produced by the orchards on Alpha to be perfectly correlated with each other, and uncorrelated with the number produced by the orchard on Beta. In this case, the correlation matrix could look like

$$MCOR = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \tag{1}$$

where the first two rows (columns) represent the two orchards on Alpha and the last row (column) the one on Beta.

To generate sustained flows, new endowment that was previously not tradable must be created every period. For example, actors in countries could issue new bonds that were previously not tradable (e.g. new bonds that are not replacing maturing bonds). It is assumed that every period, γ times the endowment w_{it} is distributed to every agent i as well as the ownership of this additional endowment.[5] In the standard CCAPM model, no new assets are being created and $\gamma = 0$.

[4] The identical assumption is that purchasing power parity holds, the perishable assumption so that agents cannot store the good and the tradable assumption so that agents are not stuck in the autarky equilibrium.

[5] The results shown here also hold for the case, where assets randomly default and need to be replaced.

In this model, we assume that asset growth is not stochastic, but asset returns are.[6] Specifically, we assume that this number is a fixed fraction of the already existing trees. This assumption allows us to further specify the endowment process as $E(w_{it+1}) = w_{t+1} = \varepsilon_t(1+\gamma)^t$, where $(1+\gamma) \geq 1$ and $\varepsilon_t \sim N(\varepsilon, \Sigma(\varepsilon))$ for all agents and the known mean ε and covariance matrix $\Sigma(\varepsilon)$. In the orchard analogy, this means that every period, a number of new trees grow.

The assumption that the growth is the same across countries has two main reasons. First, for example Caballero et al. (2008) already shows that if there is unequal growth, there are net capital flows. Here, it is shown that even if the endowments grow at the same (constant) rate, there can be sustained net capital flows. Including unequal growth makes it difficult to distinguish what part of the capital flow is due to the unequal growth and what part would be there even with equal growth. The second reason is to avoid that the covariance matrix changes over time. If the endowment of one country grows faster than that of others, its share in global endowment increases, causing its covariance with the global cycle to increase as well.

Agents maximize the discounted expected utility of the form:

$$\max \sum_{t=0}^{\infty} \beta^t E[U_i(C_{it})] \tag{2}$$

where $0 < \beta < 1$ is the discount factor and the utility function is assumed to have a CRRA form.

The agents can trade claims on their endowments with each other. In period t, agent i can buy the fraction $0 \leq \theta_{ijt+1} \leq 1$ of j's current endowment that has price q_{jt}.

Agent i receives the endowment of the consumption good according to the shares owned plus the newly generated assets

$$\sum_{j=1}^{n} \theta_{ij,t} w_{jt} + \gamma w_{it} \tag{3}$$

[6] As Caballero et al. (2008), we assume that new trees (or assets) are generated at a constant rate over time, but they are apples (or returns) are stochastic.

and owns a portfolio of shares of all endowments from country $j \in 1, ..., n$

$$\sum_{j=1}^{n} \theta_{ij,t} q_{jt} + \gamma q_{it} \tag{4}$$

at prices q_{jt}. The agent then uses these to buy the portfolio for period $t+1$

$$\sum_{j=1}^{n} \theta_{ij,t+1} q_{jt} \tag{5}$$

at prices q_{jt} as well as the consumption good C_{it}, the numeraire good. Combining these terms, the budget constraint becomes

$$C_{it} + \sum_{j=1}^{n} \theta_{ij,t+1} q_{jt} = \sum_{j=1}^{n} \theta_{ij,t}(w_{jt} + q_{jt}) + \gamma(w_{it} + q_{it}), \tag{6}$$

The timing in this economy is agents receiving their portfolio shares and endowments first. Then markets open and they can trade the portfolio shares and endowments. Lastly, agents consume their consumption good. Agents cannot own negative shares:

$$\theta_{ijt} \geq 0 \qquad \forall i, j, t \tag{7}$$

Agents thus maximize equation 2, subject to the two constraints in equations 6 and 7. If equation 6 is used to replace C_{it} in 2 and maximized with respect to θ_{ijt+1}, the first order condition then becomes:

$$\frac{dL_i}{d\theta_{ijt+1}} = -q_{jt} U'(C_{it}) + \beta E[U'(C_{it+1})(w_{jt+1} + q_{jt+1})] + \lambda_j \tag{8}$$

$$= 0 \tag{9}$$

where λ_j is the Lagrange multiplier of constraint 7.

To obtain a CCAPM expression for returns, it is necessary that all shares are greater than 0, otherwise λ_j might not be equal to 0. Next, we impose the market clearing condition

$$\sum_{j}^{n} C_{jt} = \sum_{j=1}^{n} w_{jt}. \tag{10}$$

In the symmetric equilibrium, all agents have the same portfolio $\theta_{ijt+1} = \frac{1+\gamma}{n}\ \forall j \neq i$ and $\theta_{iit+1} = \frac{1-(n-1)\gamma}{n}$ at the end of the period, provided this allocation is feasible.[7] At the beginning of the period, once the new endowment is generated, agent i would receive the additional endowment of γw_{it} bringing the total endowment held to $\frac{1+\gamma}{n}\frac{w_{it}}{1+\gamma} = \frac{1}{n}w_{it}$ from the own country and $\frac{1}{n}w_{jt}$ from other countries.[8] All agents thus receive the same endowment and return on their portfolios. The portfolio shares are allocated the same way as the endowments.

With $\theta_{ijt} > 0,\ \forall i,j,t$, the expression 8 can be rearranged into the CCAPM format of

$$1 = E\left[\frac{U'(C_{it+1})}{U'(C_{it})}\beta(1+r_{jt+1})\right], \tag{11}$$

Where $1 + r_{jt+1} = \frac{w_{jt+1}+q_{jt+1}}{q_{jt}}$. With CRRA utility of the form $U(c) = log(c)$, the intertemporal rate of substitution can be expressed as the rate of consumption growth $\frac{U'(C_{it+1})}{U'(C_{it})} = (1+r^c_{it+1})^{-1}$. Utilizing the definition of the covariance, this can be rearranged further to

$$E\left[\beta(1+r_{jt+1})\right] = E\left[(1+r^c_{it+1})\right] - E\left[(1+r^c_{it+1})\right] * COV\left[(1+r^c_{it+1})^{-1}, \beta(1+r_{jt+1})\right] \tag{12}$$

This is the common result for CCAPM, where the asset return increases with its covariance with consumption growth. Because of the diversified portfolio, the consumption of agent i in period t will be a fraction of the sum of all endowments in period t. Therefore r^c_{it} reflects the movement of global endowments or global cycle.[9] Together with equation 12, this implies that endowments of countries highly correlated with the global cycle will yield a

[7]We assume that n and γ are sufficiently small, such that this allocation is feasible. If not, agents will not be able to fully insure idiosyncratic risk. For example, with n=10 and $\gamma = 0.2$ for all j, even if agents hold none of their own assets at the end of each period, they receive 0.2/1.2*100=16.7% of their home endowment at the beginning of every period. As every country wants to hold equal shares of all assets, 10% is optimal. A violation of this assumption could potentially help to explain part of the home bias puzzle as well.

[8]As the assets were traded in terms of last periods total available assets, they need to be discounted as the total available assets increased.

[9]Many papers that test the consumption CAPM model use the assumption that portfolios are perfectly diversified and thus consumption of any agent is a fixed fraction of global endowments. This allows the use of consumption correlations determining returns instead of global endowment correlations.

higher return than assets of countries that are less correlated with the global cycle, as shown for example in Lustig and Verdelhan (2007).

Alternatively, equation 11 can be restated in terms of the price of assets

$$q_{it} = \sum_{k=1}^{\infty} E\left[\frac{U'(C_{it+k})}{U'(C_{it})}\beta^k(w_{jt+k})\right], \tag{13}$$

assuming $\lim_{k\to\infty} E\left[\frac{U'(C_{it+k})}{U'(C_{it})}\beta^k(q_{jt+k})\right] = 0$. Since the expected consumption growth is identical across countries, as is the expected endowment, any differences in prices are due to the correlation/covariance between the endowment growth of a specific country and the global endowment growth. Given that equation 11 and 13 have the same structure, this implies that the higher the correlation/covariance between between a country's endowment and the global cycle, the lower the price q_{it} from equation 12. This is because the assets of country i are less attractive to insure against global consumption risk.[10]

Based on the optimal portfolio shares, agent i wants to purchase $\frac{\gamma}{n}$ of the assets from each other agent j and sell $\frac{(n-1)\gamma}{n}$ of the assets to the other agents in every period to maintain a balanced portfolio. For an agent i whose endowment is highly correlated with the global cycle, the price q_{it} is less than q_{jt}, the return for some agent j whose endowment is less correlated with the global cycle. Agent i thus sells $q_{it}\frac{\gamma}{n}$ and gets $q_{jt}\frac{\gamma}{n}$, but since $q_{it}\frac{\gamma}{n} < q_{jt}\frac{\gamma}{n}$, agent i needs to give agent j more than the endowment share for both sides to become equal. The only additional thing available to agent i is his consumption. Since there are more than two agents, the amount i gives to other agents becomes $q_{it}\frac{(n-1)\gamma}{n}$ and the amount he receives from other agents is $\sum_{j\neq i} q_{jt}\frac{\gamma}{n}$. Which of the two is greater or smaller now depends on the correlation of all agents with the global cycle and can be defined as the net capital flow.

The net capital outflow is defined as

$$NCO_{it} = CA_{it} = \sum_j \theta_{jit+1}q_{it} - \sum_j \theta_{ijt}q_{jt} = \sum_j \theta_{ijt}w_{jt} + \gamma_i w_{it} - C_{it}. \tag{14}$$

[10]Note that even if countries were not completely diversifying their portfolio, assets with a low correlation with the global cycle are still more attractive than others. As a result, the the net capital flow results should still hold in that case. This is also one of the reasons, why we use the global cycle instead of consumption growth of any specific country.

Agents that consume more than the portfolio of endowment shares they own ($\theta'_{it} w_t$) will be the agents who were able to exchange their endowment shares that have a low correlation with the global cycle against endowment shares with a higher correlation and the consumption good. This trade of assets against goods leads to a net capital flow. Countries that are highly correlated with the global cycle should thus have a net capital outflow as they send the consumption good abroad, while countries that have a low correlation with the global cycle should have a negative net capital outflow (net capital inflow).

Intuitively with the three agent orchard example, world output in this economy is given by the total output of the three orchards. As the two orchards on Alpha face the same weather and make up two thirds of global output (in expectations), they are more correlated with global output than the third orchard on Beta. To insure their idiosyncratic risk, the two orchards on Alpha are both eager to obtain claims on the trees on Beta, preferably holding claims on half of their own orchard and on half of the orchard on Beta. Because there are more trees on Alpha than on Beta, the price reflects this and claims on Alpha trees are cheaper than claims on Beta trees. As every tree produces the same number of identical apples (in expectations), the return on Alpha trees is larger than the return on Beta trees due to the price difference of claims on the trees.

The optimal allocation of claims is achieved if every agent holds one third of each orchard. But since one third of the orchard on Beta is worth more than one third of the orchards on Alpha, there needs to be a flow in apples as well. More specifically, for the agents on Alpha to obtain claims on trees on Beta, they need to give some apples to the agent on Beta in addition to the claims on their own orchard. This creates a net capital outflow from agents on Alpha to the agent on Beta. Or more broadly, a net capital outflow from agents highly correlated with the global cycle and a net inflow to agents with a low correlation with the global cycle.

3 Data

The main new insight of the model introduced in the previous section is that endowment correlations should be an important driver of net capital flows. In order to test this hypothesis empirically, we use total factor productivity (TFP) growth data as a proxy for the endowment growth in line with Gourinchas and Jeanne (2013). However, we also present results using GDP growth instead. Similarly, we will present results for both the correlation and covariance in line with David et al. (2014).

We use country-level annual data covering the period from 1990 until 2014 mainly from four sources: The Penn World Tables 9.0 (PWT), the historic data from the fall 2018 World Economic Outlook (WEO) of the IMF, the World Bank database (WB) and the updated Chinn and Ito (2006) data set. Most of the controls come from the WB, the current account as percent of GDP as a proxy for net capital flows from the WEO and the productivity (or GDP) growth from PWT.

We chose to start in 1990 as this gives us a long enough time frame to obtain reliable productivity correlations, as it includes both upturns and downturns, while avoiding a significant reduction in the number of countries included if we extended it further back.

To calculate the correlations across countries, it is first necessary to calculate global productivity (or GDP). We use the productivity (GDP) data from PWT and use as the weights the WEO data. We calculate growth rates for the indicator and use the share of each country in the world each year in terms of USD GDP for the weights.[11] Specifically, for each period,

$$\%\Delta globTFP_t = \frac{\sum_i USDGDP_{it} * \%\Delta TFP_{it}}{\sum_i USDGDP_{it}} \tag{15}$$

Next, we calculate the correlation (and covariance) between this global productivity (or GDP) growth and each country's growth for the entire period. Due to this transformation, we end up with a cross-section with one observation per country. As the business cycle is one

[11] We also tried PPP weights, but the results remain qualitatively the same. There is a correlation of more than 0.9 between the PPP weighted and USD weighted series.

important driver of the analysis and we want as many as possible to estimate the correlation (and covariance) as accurately as possible, we do not use a panel of five or ten year averages. Our main estimation equation then becomes

$$NCO_i = \alpha + \beta PCorr_i + \gamma X_i + \varepsilon_i, \tag{16}$$

where NCO_i is the net capital outflow as measured by the current account as a percentage of GDP, PCorr is the TFP (or GDP) growth correlation with the global cycle, X are the controls and ε is the error term.

4 Empirical results

Our first set of results presented in Table 1 regress the average annual current account as % of GDP on the correlation of each country with the global cycle as measured by productivity (TFP). The first column only controls for the average annual productivity growth (Pave) and the correlation (PCorr) has the correct sign and is highly significant. The next column includes regional dummies for the seven World Bank regions and the results do not change significantly.[12] The third column includes the additional controls: average population growth (Pop), average dependency ratio (DepR), initial net foreign asset position as % of GDP (NFA), initial log GDP per capita (GDPPC) measured in purchasing power parity and foreign aid received as % of GDP (FAid). These are some of the main variables included in Chinn and Prasad (2003) as explanatory factors for the current account. While most of them appear not to be significant, they also cause the correlation to become insignificant at the 5% level. The fourth column shows the results for the covariance (PCov) instead of the correlation and the relationship is much stronger and still highly significant.

In terms of magnitude, the coefficient on the correlation suggests that for each 0.1 increase in the correlation with the global cycle, the current account as a % of GDP would increase by 0.5 percentage points for the third specification with the controls.

[12]These regions are East-Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, North America, South Asia, and Sub-Saharan Africa.

Table 1: TFP Regression Results

	Dependent variable:				
	CA as % of GDP (1990-2014)				
	(1)	(2)	(3)	(4)	(5)
PCorr	9.546***	8.527***	4.975*		7.998**
	(2.255)	(2.981)	(2.740)		(3.118)
PCov				290.651**	
				(119.328)	
Pave	−35.846	−17.364	45.751	31.265	79.181
	(76.950)	(86.468)	(70.266)	(68.797)	(92.758)
Pop			0.119	−0.293	0.252
			(0.655)	(0.634)	(0.727)
DepR			0.078	0.097	0.086
			(0.064)	(0.063)	(0.071)
NFA			5.891**	4.229	8.410**
			(2.535)	(2.607)	(3.110)
GDPPC			3.602***	3.855***	2.930**
			(1.192)	(1.143)	(1.378)
FAid			−35.521	−32.174	−42.770
			(23.443)	(22.839)	(48.168)
Observations	91	91	59	59	47
Reg. dummies	No	Yes	Yes	Yes	Yes
R^2	0.169	0.221	0.700	0.716	0.647
Adjusted R^2	0.150	0.145	0.613	0.633	0.508

Note: All columns except the first one include regional dummies. The last column only includes countries, where the Chinn-Ito index scaled between 0 and 1 takes a value of at least 0.2. Standard errors in brackets. *p<0.1; **p<0.05; ***p<0.01

Overall, the results reconfirm the results by Gourinchas and Jeanne (2013) that net capital does not flow to where the highest returns in the form of productivity growth rates are. However, there is quite a bit of evidence that capital flows where the lowest covariance with the global cycle is. The fifth column in table 1 strengthens this argument, as this regression only includes countries that have an open capital account as measured by the Chinn and Ito (2006) index - this means having a value that is higher than 0.2, with the index ranging from 0 to 1, where 1 is completely open. In this case, the correlation is again highly significant, even when controlling for all these factors.

Next, we present the same results in Table 2, but with TFP growth replaced by production side real GDP from PWT. The correlation and covariance are still highly significant in most specifications, while most other variables provide at best mixed results. In contrast to Table 1, GDP per capita appears insignificant and foreign aid becomes highly significant.

One important variable we excluded so far is the public primary balance as % of GDP, which could be another important factor. The main reason this variable was excluded so far was the limited data availability for the entire sample. If we shrink the sample to start in 2000, we can include the primary balance as shown in Table 3.

As in the previous results, the correlation or covariance with the global factor appears to be very important. The key other explanatory factors are the initial net foreign asset position, foreign aid and the primary balance, all as a % of GDP.

Next, we check if including only high income countries or countries that are not managing their reserves heavily alter the results. We use the World Bank definition for high income countries and exclude countries where the average reserves over the entire period exceed 10% of GDP. We exclude some of the controls as the number of observations was already low. The first two columns in Table 4 show that the cyclical correlation remains significant for high income countries only. Given that this result holds even within high income countries confirms that our previous results are not driven by some relationship between high income countries on the one hand and low income ones on the other.

The last two columns of Table 4 show that our results are robust to including only

Table 2: Regression Results

	Dependent variable:				
	CA as % of GDP (1990-2014)				
	(1)	(2)	(3)	(4)	(5)
GDPCorr	13.687***	13.029***	6.522**		5.707*
	(1.965)	(2.177)	(2.531)		(2.990)
GDPCov				76.122***	
				(22.941)	
GDPave	−14.516	−40.793*	19.377	0.775	139.713***
	(20.042)	(21.984)	(34.446)	(34.039)	(45.356)
Pop			−0.031	−0.385	−1.801*
			(0.758)	(0.733)	(0.906)
DepR			0.060	0.084	0.120
			(0.068)	(0.066)	(0.072)
NFA			4.619*	4.382*	5.947*
			(2.470)	(2.394)	(2.962)
GDPPC			1.046	1.004	2.893*
			(1.155)	(1.100)	(1.436)
FAid			−47.410***	−51.762***	23.496
			(17.669)	(17.182)	(46.222)
Observations	124	124	74	74	52
Reg. dummies	No	Yes	Yes	Yes	Yes
R^2	0.287	0.371	0.590	0.615	0.646
Adjusted R^2	0.275	0.328	0.501	0.532	0.525

Note: All columns except the first one include regional dummies. The last column only includes countries, where the Chinn-Ito index scaled between 0 and 1 takes a value of at least 0.2. Standard errors in brackets. *p<0.1; **p<0.05; ***p<0.01

Table 3: Regression Results

	Dependent variable:		
	CA as % of GDP (2000-2014)		
	(1)	(2)	(3)
GDPCorr	11.029***	5.153**	
	(1.916)	(2.390)	
GDPCov			59.680***
			(17.420)
GDPave	22.911	13.664	−16.578
	(16.815)	(25.849)	(27.208)
Pop		0.613	0.507
		(0.744)	(0.708)
DepR		0.076	0.093
		(0.067)	(0.065)
NFA		9.288***	8.682***
		(3.141)	(3.020)
GDPPC		0.692	0.469
		(1.151)	(1.093)
FAid		−68.039***	−69.250***
		(24.012)	(22.997)
PrBal		0.851***	0.682***
		(0.193)	(0.195)
Observations	153	91	91
Reg. dummies	Yes	Yes	Yes
R^2	0.326	0.646	0.674
Adjusted R^2	0.288	0.581	0.615

Note: All columns include regional dummies. Standard errors in brackets. *p<0.1; **p<0.05; ***p<0.01

countries that do not have large foreign exchange reserves. As with high income countries, we did not include all of our controls, as the number of observations is already relatively low.

Taken together, the results presented in this section support the implication of our model - that is, that the cyclical correlations between the global cycle and individual country's cycles are one important driver of sustained net capital flows.

Table 4: Regression Results

	Dependent variable:			
	CA as % of GDP (1990-2014)			
	(1)	(2)	(3)	(4)
GDPCorr	17.829**		7.265**	
	(6.414)		(3.050)	
GDPCov		99.500*		70.573**
		(49.696)		(26.645)
GDPave			−12.109	−68.749*
			(49.943)	(36.224)
Pop			−2.486*	−3.120**
			(1.283)	(1.236)
DepR			0.127	0.121
			(0.164)	(0.158)
NFA	4.545	0.713	−2.392	0.158
	(4.098)	(5.286)	(3.482)	(2.990)
GDPPC	1.738	5.722	−1.613	−1.837
	(3.279)	(3.911)	(1.945)	(1.878)
FAid	−360.030*	−328.604	−81.342***	−85.472***
	(179.350)	(211.792)	(22.028)	(20.582)
PrBal	0.339	0.237		
	(0.406)	(0.496)		
Observations	16	16	18	18
Reg. dummies	No	No	No	No
R^2	0.727	0.655	0.858	0.869
Adjusted R^2	0.591	0.482	0.758	0.777

Note: The first two columns only include high income countries and the last two columns only include countries for which the international reserves are lower than 10% of GDP. Standard errors in brackets. *p<0.1; **p<0.05; ***p<0.01

5 Conclusion

In this paper, we contribute to the literature on sustained net capital flows by introducing a CCAPM in which endowment correlations of countries with the global cycle can cause sustained cross-country net capital flows. We then test the implications of the model empirically; various regressions find the model matches the data quite well. Indeed, countries whose productivity growth rates show a low correlation with global productivity growth see large net inflows; conversely, an increase of 0.1 in the correlation with the global cycle leads to an decrease in net capital inflows of around 0.5-0.8 % of GDP. This suggests that the magnitudes of the returns are not drivers of net capital flows by themselves; rather, the drivers are the return correlations that insure cyclical consumption risk.

Our findings also indicate that the cross-country net capital flow patterns which give rise to the Lucas puzzle can, at least in part, be explained by the risk smoothing behavior in the modified CCAPM introduced in this paper.

The empirical results also suggest that the consumption smoothing behaviour is orthogonal to other factors, as the coefficient remains significant after controlling for a number of other variables.

While we showed that our model has strong implications for sustained flows, we have not addressed cyclical flows here. Future research might be able to show what impact the modified CCAPM has on cyclical flows. In particular, one could test if the well known cyclical pattern in net capital flows is consistent with model.

Another big question that arises from our results is what is driving these correlations. We have shown that the correlations are very important for cross-country net capital flows, but we have little information about what causes these correlations. While it is likely that they are related to industry composition, geographic proximity and idiosyncratic shocks, identifying those would have important policy implications.

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